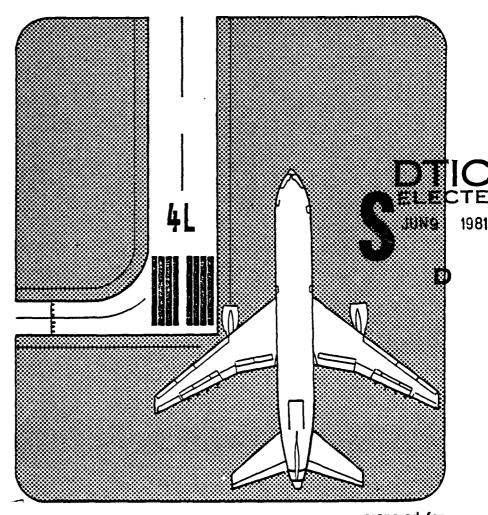
PEAT MARWICK MITCHELL AND CO SAN FRANCISCO CALIF F/6 1/2 NEW YORK AIRPORTS DATA PACKAGE NUMBER 2, JOHN F, KENNEDY INTERN—ETC(U) AUG 78 AD-A099 865 UNCLASSIFIED 1 or 2

NEW YORK AIRPORTS (

DATA PACKAGE NO. 2

JOHN F. KENNEDY INTERNATIONAL AIRPORT LA GUARDIA AIRPORT.

AIRPORT IMPROVEMENT TASK FORCE DELAY STUDIES.



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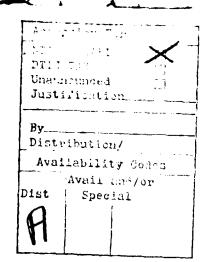
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Peat, Marwick, Mitchell & Co.

AUGUST 1978

81 6 08 128



Telephone: (415) 347-9521

August 23, 1978

Mr. Ray Fowler, AEM-100 U.S. Federal Aviation Administration 800 Independence Avenue, S.W. Washington, D.C. 20591

Re: Input Data for New York Simulation Model Stage-1 Experiments and Annual Delay Baseline Experiment

Dear Ray:

Enclosed are preliminary data packages for use during the third Task Force meeting on August 24, 1978:

- o Attachment A contains the calibration results for John F. Kennedy International Airport and LaGuardia Airport.
- o Attachments B and C contain the input data for the Stage-1 Experiments, respectively, for John F. Kennedy International Airport and LaGuardia Airport.

These attachments should be reviewed, revised, and approved by the New York Task Force prior to use in the Stage-1 model runs.

Sincerely,

Stephen L. M. Hockaday Manager

SLMH/nbe Enclosures



Appropriation STATEMENT A

Tistribution Unlimited

Attachment A

NY CALIBRATION RESULTS

John F. Kennedy International Airport and LaGuardia Airport

New York
Airport Improvement Task Force Delay Studies

Peat, Marwick, Mitchell & Co. San Francisco, California 94128

August 1978

John F. Kennedy International Airport

CALIBRATION RESULTS

I. Arrival Flow Rates

Runway	Time Interval	Field Data	Calibrated Model
31 <u>r</u>	20 - 21:00	27	27
31 R	21 - 22:00	23	23
31R	22 - 23:00	15	15
31L	20 - 21:00	17	17
31L	21 - 22:00	13	13
31L	22 - 23:00	3	4

II. Departure Flow Rates

Runway	Time Interval	Field Data	Calibrated Model
31L	20 - 21:00	20	21
31L	21 - 22:00	24	25
31L	22 - 23:00	33	29

III. Average Fix-To-Threshold Arrival Travel Times

<u>Fix</u>	Runway	Class	Time Interval	Field Data	Calibrated Model
В	31R	1	21 - 22:00	10.0	10.5
B	31R	1	22 - 23:00	13.0	10.7
G	31R	1	21 - 22:00	11.3	10.4
G	31R	ī	22 - 23:00	12.4	10.4
Weigh	nted Aver	age.	21 - 22:00	12.3	10.9
_	ited Aver	-	22 - 23:00	11.5	11.0

IV. Weighted Average Gate-To-Roll Departure Travel Times

Time Interval	Field Data	Calibrated Model
20 - 21:00	8.1	9.7
21 - 22:00	11.9	9.0
22 - 23:00	10.9	11.5
Weighted Average	10.4	10.2

LaGuardia Airport

CALIBRATION RESULTS

I. Arrival Flow Rates

Runway	Time Interval	Field Data	Calibrated Model
22	20 - 21:00	39	36
	21 - 22:00	33	36
	22 - 23:00	39	38

II. Departure Flow Rates

Runway	Time Interval	Field Data	Calibrated Model
13	20 - 21:00	29	30
	21 - 22:00	36	38
	22 - 23:00	39	36

III. Average Fix-To-Threshold Arrival Travel Times

<u>Fix</u>	Runway	Class	Time Interval	Field Data	Calibrated Model
С	22	2	20 - 21:00	9.1	9.2
C	22	2	21 - 22:00	10.0	10.4
С	22	2.	22 - 23:00	9.2	9.8
R	22	2	20 - 21:00	15.4	15.0
R	22	2	21 - 22:00	16.7	16.8
R	22	2	23 - 23:00	16.0	15.7
w	22	2	20 - 21:00	19.5	17.0
W	22	2	21 - 22:00	21.1	20.1
W	22	2	22 - 23:00	19.2	17.0

IV. Weighted Average Gate-To-Roll Departure Travel Times

Time Interval	Field Data	Calibrated Model
20 - 21:00	8.7	8.5
21 - 22:00	17.4	16.5
22 - 23:00	20.0	17.2

Attachment B

INPUT DATA SUMMARY STAGE 1 EXPERIMENTS

John F. Kennedy International Airport

New York
Airport Improvement Task Force Delay Studies

Peat, Marwick, Mitchell & Co. San Francisco, California 94128

August 1978

TABLE III-1 (REVISED)

KENNEDY DELAY EXPERIMENTS

Experiment Number	Model	Study Case	Arrival Runways	Departure Runways	Weather	Demand	ATC System Scenario	Near-Term Improvements
Stage I Experiments								
1	asm ^c	1	13B, 22L, 22R	22R	VFR1	1977	Today's	None ^d
2	ASM	2	22L	22R	IFRL	1977	Today's	None
2A	ASM	2	22L	22R	IFRI	1977	Today's	None ^k
3	ASM	4	4L, 4R	4L	VFR1	1977	Today's	None
4	ASM	5	4R	4L	IFR1	1977	Today's	None
5	ASM	7	31L, 31R	31L	VFR1	1977	Today's	None
6	ASM	8	31R	31L	IFRL	1977	Today's	None
7	ASM	10	13L, 13R	13R	VFRl	1977	Today's	None
8	ASM	11 f	13L	13R	IFR1	1977	Today's	None
9	ADM	n.a.	n.a.	n.a.	n.a.	1977	Today's	None
15	ASM	8	31L, 31R	31L	IFR1	1977	Today's	gđ
16	asm	7	31L, 31R	31L, 31R	VFR1	1977	Today's	h
18	ASM	5	4L, 4R	4L	IFRL	1977	Today's	i
19	ASM	2	22L	22R	IFR1	1977	Today's	j

a. Study cases (combinations of runway use and weather conditions) and potential near-term improvements are identified in New York Airport Improvement Task Force Interim Report. The study cases are shown in Figure III-1. The potential improvements are identified in Appendix B.

c. Airfield Simulation Model.

b. FAA will describe impact of post-1982 ATC systems on model inputs.

d. Task Force will establish packages of near-term improvements most likely to be implemented in pre-1982 and post-1982 time frames.

f. Not applicable (model considers annual occurrence of each study case).

g. Has procedure for independent arrivals and independent departures on 31L and 31R.

h. Has indepedent departure tracks R31L and R31R.

i. Permits 3 miles staggered arrival separation 4R and 4L.

j. Extends parallel taxiway to runway and 31L and adds a new turnoff to R22L.
 k. Turnoff J on Runway 22L is assuemd closed.

JFK
INDEX OF STAGE 1 EXPERIMENTS*

Sequence No.	Experiment No.	Study Case No.	Model	Type of Input Description	Page
1	1	1	ASM	Full	6
2	2	2	ASM	Change-Sheet	14
3	2A	2	ASM	Change-Sheet	16
4	19	2	ASM	Change-Sheet	18
5	3	4	ASM	Full	20
6	4	5	ASM	Change-Sheet	28
7	18	5	ASM	Change-Sheet	30
8	5	7	ASM	Full	32
9	16	7	ASM	Change-Sheet	39
10	6	8	ASM	Change-Sheet	41
11	15	8	ASM	Change-Sheet	43
12	7	10	ASM	Full	45
13	8	11	ASM	Change-Sheet	53
14	9		ADM	Full	

^{*}Stage 1 experiments as presented in revised Table III-1 but reorganized and grouped by like runway-use configurations.

JFK - STAGE 1

Experiment No. 1

Objective:

To obtain baseline delay estimates for the following runway configuration in VFR 1:

Arrival Runways Departure Runways

13R, 22L, 22R

22R

Related Comparison Experiments:

Experiments 2, 2A, and 19 have similar runway-use configurations but different weather conditions, namely IFRl instead of VFR 1.

Remaining Data Items:

- o Time period to be simulated 1500 to 1900 hours local time?
- o Schedule inputs and lateness distribution? (see attached input data summary)

JFK INPUT DATA - EXPERIMENT 1

A. LOGISTICS

- 1. Title: John F. Kennedy International Airport Airfield Simulation Model Run
- 2. Random Number Seeds: 2017, 3069, 4235, 5873, 6981, 7137, 8099, 9355, 0123, 1985.
- 3. Start and Finish Times: To be selected by Task Force 1500 1900 hours.
- 4. Print Options: Detailed run for one random number seed.
 Summary run for ten random number seeds.

5.	Airline Names:	Name	Code
		Air Freight	AF
		Air Taxi	AT
		Allegheny	AL
		American	AA
		Braniff	BN
		Delta	\mathtt{DL}
		Eastern	EA
		Foreign International	FI
		National	NA
		Northwest	NW
		Pan American	PA
		Trans World	TW
		United	UA

- 6. Processing Options: First run to check model input. Other runw in COMPUTE mode.
- 7. Truncation Limits: + 3 standard deviations.
- 8. Time Switch: Not applicable.

B. AIRFIELD PHYSICAL CHARACTERISTICS

- 9. Airfield Network: See Figure 1.
- 10. Number of Runways: 3.

- 11. Runway Identification: 13R, 22L, 22R.
- 12. Departure Runway End Links: 172.
- 13. Runway Crossing Links: 38, 133, 286.
- 14. Exit Taxiway Location: 101, 106, 115, 181, 182, 183, 193, 194, 195, 468.
- 15. Holding Areas: Not applicable.
- 16. Airline Gates: Not applicable.
- 17. General Aviation Basing Areas: West of terminal area between Taxiways O and Q; area No. 13.

C. ATC PROCEDURES

18. Aircraft Separations:

Arrival-Arrival Separation (n.m.)

1. VFR: According to Report No. FAA-EM-78-8A.

		Trail	Aircraft	Class
		В	C	<u>D</u>
Lead	В	1.9	1.9	1.9
Aircraft	C	1.9	1.9	1.9
Class	D	3.6	3.6	2.7

Departure-Departure Separations (seconds)

2. VFR

		Trail	Aircraft	Class
		В	<u> </u>	C
Lead	В	45	45	50
Aircraft	C	60	60	60
Class	D	120	120	90

Departure-Arrival Separation (n.m): To be based on reduced field data, departure runway occupancy times and discussions with

ATC personnel.

Arrival-Departure Separation (seconds):

To be based on reduced field data, arrival runway occupancy times, and discussion with ATC personnel.

- 19. Route Data: See Figure 2.
- 20. Two-Way Path Data: 205, 206, 267.

21. Common Approach Paths:

Aircraft Class	Length of Common Approach Path
A	2,0
В	3.0
С	6.0
D	6.0

22. Vectoring Delays:

This input allocates delays among vectoring and holding. Model input values will be used that hold arrival aircraft if delays to arrival aircraft exceed 15 minutes.

23. Departure Runway Queue Control:

Aircraft are assigned departure runways to preclude airspace crossovers, not to balance departure queues.

24. Gate Hold Control:

Aircraft are held at gates when departure queue at runway is 20 (15 in queue plus 5 taxiing) or more, except when gate holds would cause gate congestion.

25. Departure Airspace Constraints:

Aircraft are not held at gates due to departure airspace constraints.

26. Inter-Arrival Gap:

With this runway use, arrival aircraft are delayed in the arrival airspace when departure delays exceed 20 minutes.

27. Runway Crossing Delay Control:

Arrival and departure runway operations are only interrupted for a taxiing aircraft to cross an active runway when the taxiing aircraft is delayed by 10 minutes or more.

D. AIRCRAFT OPERATIONAL CHARACTERISTICS

28. Exit Taxiway Utilization:

			Exit Utilization (Percent)		
		Class	N	M	L
Runway	13R	В	61	39	0
•		С	0	41	59
		D	0	24	76
				Utiliz Percent	
		01-00	H	J	JA
		Class			
Runway	22L	В	17	33	50
_		C	10	33	57
		D	0	16	84
				Utili2	
			(1	ercent	
		Class	G	<u>H</u>	UU
Runway	22R	В	0	100	0
-		C	0	0	100
		D	0	0	100

29. Arrival Runway Occupancy Times:

			Runway	Occupancy (Seconds)	Times
		Class	N	M	L
Runway	13R	В	40	51	-
_		С	-	45	48
		D	-	48	55
			Runway	Occupancy (Seconds)	Times
		Class	H	J	JA
Runway	22L	В	33	45	54
_		С	32	37	50
		D	-	42	50
				Occupancy (Seconds)	Times
		Class	G	H	טט
Runway	22R	В	-	35	-
_		C	-	~	45
		D	-	-	50

30. Touch & Go Occupancy Times: Not applicable.

31. Departure Runway occupancy Times:

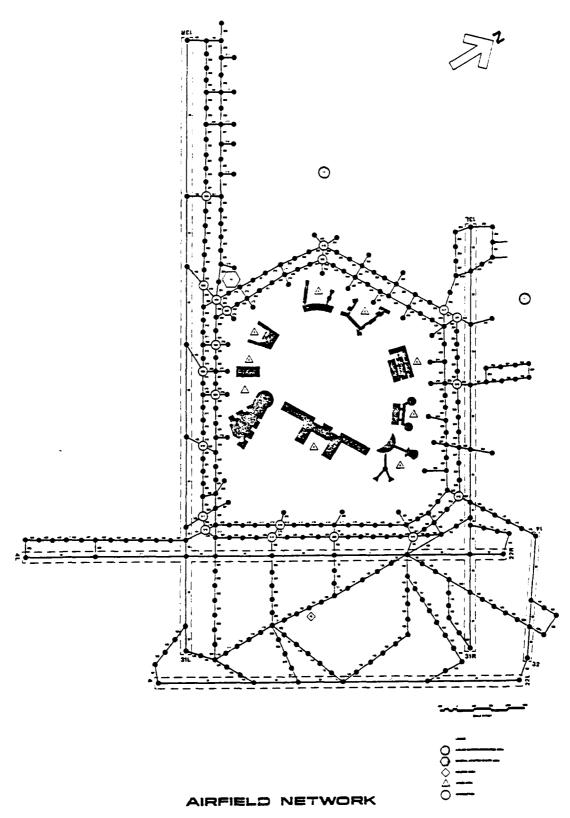
Aircraft	Runway Oc	cupancy Time (seconds)
Class	Mean	Standard Deviation
A	34	4
В	34	4
С	39	4
D	39	4

32. Taxi Speeds: To be based on reduced field data.

33. Approach Speeds:

Aircraft		Approach	Speed	(knots)
Class	Mean		Standa	rd Deviation
В	120			10
C	130			10
D	140			10

- 34. Gate Service Times: Not applicable.
- 35. Airspace Travel Times: To be based on reduced field data.
- 36. Runway Crossing Times: Based on reduced field data (20 seconds).
- 37 <u>Lateness Distribution</u>: To be determined by Task Force.
- 38. Demand: Schedule to be determined by Task Force.



JOHN F. KENNEDY INTERNATIONAL AIRPORT

(Under Development)

Figure 2

JFK - STAGE 1

Experiment No. 2

Objective:

To obtain baseline delay estimates for the following runway-use configuration in IFR1:

Arrival Runways Departure Runways

22L

22R

Related Comparison Experiments:

Experiments 2A and 19 are for the same runway-use configuration but for different exit taxiway arrangements.

Remaining Data Items:

- o Time period to be simulated
- o Schedule inputs and lateness distribution.

(See attached change sheet)

Experiment Number: 2 (Input changes from experiment number 1)

SIMULATION MODEL INPUT	DESCRIPTION OF INPUT CHANGE
L latities .	
1 male	
2 Nacion number saeds	
3 Start and Claims times	
4 Print options	
5 Aimline manes	
6 Processing options	
7 Sympanies United	
I mine switch	
•	
h. Airtield Physical Caracteristics	
9 Airfield necrosis	
. 10 Number of runsays	No arrivals on Runway 13R
11 Description	
12' Departure runsey and links	
13 Remay crossing links	
14 Trin turing location	
li Wolding arms	
15 Aimline gates	
17 General aviation basing arras	
· ·	
c. ACC Procedures	
13 Airmait saparations	IFR1 Weather Conditions
19 Zenta data .	No routes from 13R to gate areas.
20 District City	
21 Common approach parks	IFR1
22 Vectoring delays	<u> </u>
22 Separates remed domes country?	
24 Gate held control.	
25 Department alempade constraines	
26 Capazzara queus .	
27 Resvay crossing dalay control	
d. Airmait Coerational Characteristics	
23 This taxinay utilization	
29 Arrival runnay company times	IFR1 Values
30 Truch-and-ye maway company times	
Il Departure Times company times	
12 fami speeds	
32 Approach speeds	
34 Gate service times	
II hisspace travel times	
16 Number crossing times	
17 Lataness distribution	
	1 IFRI if different from (TDD)
35 Camang	IFR1 if different from VFR1

JFK - STAGE 1

Experiment No. 2A

Objective:

To provide baseline comparison delay estimates for the situation where exit taxiway J from arrival runway 22L is closed and aircraft that miss exit H must exit at the end of the runway and taxi up runway 31L across departure runway 22R.

Related Comparison Experiments:

Experiment 19 provides the case where a new exit (between J and H) is provided from Runway 22L and parallel taxiway I is extended to the end of Runway 31L.

Remaining Data Items:

- o Time period to be simulated
- o Schedule inputs and lateness distribution.

SIMULATION MODEL INPUT	DESCRIPTION OF INPUT CHANGE
L Logistics	
1 Tiple	
2 Pandom number seeds	
3 Start and finish times	
4 Price options	
5 Airline names	
6 Processing options	
7 Transaction Limits	-
8 Time switch	
b. Airdield Physical Caracteristics	
9 Airdeld network	
. 10 Number of remays	No arrivals on runway 138
11 Description	WILLYGIS UII FHUWAY 134
12' Coparture Funway and links	
13 Resway emissing links	
14 Exis taxivay location	
li Eolding armas	
li <u>limine gates</u>	
17 General aviation basing areas	
·	
c. ATT Procedures	
11 Airmait separations	IFR1 Weather
19 Route data	No routes from 13R to gate
20 Two-way path data	
T CIRCUM TABLESTEE STEETS	IFR1 Values
22 Vectoring delays	
23 Departure runway queue control	
24 Gats hold control.	
25 Departure Litspace constraints	
26 Caparture queue	
27 Remvay crossing delay control	
d. Airmait Coerational Characteristics	
25 Twin tariway unilization	Exit Taxiway J closed.
25 Acrival survey occupancy times	IFR Values
30 Touch-end-yo runway decumency times	
31 Departure runway occupancy times	
32 Tast speeds	
32 Approach speeds	
34 Gats service times .	
25 Airspace wavel wines	
36 Rusway crossing times	
37 Lataness distribution	
38 Command	

JFK - STAGE 1

Experiment No. 19

Objective:

To investigate potential benefits of adding an additional turnoff runway 22L between exits ${\tt H}$ and ${\tt J}$ and extending parallel taxiway I to the end of Runway 31L .

Arrival Runways Departure Runways

22L

22R

Related Comparison Experiments:

Experiments 2 and 2A.

Remaining Data Items:

- o Time period to be estimated
- o Schedule inputs and lateness distribution

SIMULATION MODEL INPUT	DESCRIPTION OF INPUT CHANGE
L beisties	
1 male	
2 Random number seeds	
3 Start and finish times	
4 Print options	
5 Aighte names	
6 Processing options	
7 Traction Linits	
1 Time switch	
· · · · · · · · · · · · · · · · · · ·	
b. Airfield Physical Curameristics	
9 Airtiald nervork	
. 10 Homber of Tombeys	No arrivals on Runway 13R
11 Among identification	
12' Departure runway and links	
13 Ammyay emossing links	
14 Eric tariway location	
15 Enling areas	
15 Airline gates	
17 General aviation basing areas	
c. ACC Procedures	
15 Aircraft separations	TRD1 V-1
19 Route data	New parallel taxiway, none from 13R
25 Two-way path data	new paratter eartway, none from 15%
21 Common approach paths	
22 Vectoring delays	IFR1 Values
23 Departure runway queue control	<u> </u>
24 Gaza bold control.	
25 Departure airspace constraints	
25 Caparine queus	
27 Runway errossing delay control	
d. Airms Coentional Characteristics	
28 Exit saxivay utilization	New Exit between H & J
29 Amival removey occupancy times	IFR1 Values
30 Truch-end-go runway occupancy times	
11 Departure runway occupancy times	
II Taxi speeds	
13 Approach speeds	
34 Gate segrice times .	
35 Airspace travel times	
37 Lateness distribution	
38 Comment	
Andrew Control of the	

JFK STAGE-1 EXPERIMENTS

Experiment No. 3

Objective:

To obtain baseline delay estimates in VFRI conditions for the following runway-use configuration:

Arrival Runways Departure Runways

4L, 4R

4L

Related Comparison Experiments:

Experiment 4 has the same basic runway-use configuration without arrivals on 4L, and Experiment 18 has the same configuration but with 3-mile staggered arrival separations on 4R and 4L.

(See attached Input Data Summary and routing map).

JFK INPUT DATA - EXPERIMENT NO. 3

A. LOGISTICS

- 1. <u>Title</u>: John F. Kennedy International Airport Airfield Simulation Model Run
- 2. Random Number Seeds: 2017, 3069, 4235, 5873, 6981, 7137, 8099, 9355, 0123, 1985.
- 3. Start and Finish Times: To be determined by Task Force.
- 4. Print Options: Detailed run for one random number seed. Summary run for ten random number seeds.

5.	Airline Names:	Name	Code
		Air Freight	AF
		Air Taxi	AT
		Allegheny	AL
		American	AA
		Braniff	BN
		Delta	DL
		Eastern	EA
		Foreign Internatioanl	FI
		National	NA
		Northwest	NW
		Pan American	PA
		Trans World	TW
		United	UA

- 6. Processing Options: First run to check model input.
 Other runw in COMPUTE mode.
- 7. Truncation Limits: + 3 standard deviations.
- 8. Time Switch: Not applicable.

B. AIRFIELD PHYSICAL CHARACTERISTICS

- 9. Airfield Network: See Figure 1.
- 10. Number of Runways: 2.
- 11. Runway Identification: 4L, 4R.
- 12. Departure Runway End Links: 456.

- 13. Runway Crossing Links: 143.
- 14. Exit Taxiway Location: 134, 144, 153, 182, 183, 184.
- 15. Holding Areas: On Taxiway Z between Runways 4L-22R and 4R-22L; area No. 10.
- 16. Airline Gates: Not applicable.
- 17. General Aviation Basing Areas: West of terminal area between Taxiways O and Q; area No. 13.

C. ATC PROCEDURES

18. Aircraft Separations:

Arrival-Arrival Separation (n.m.)

1. VFR: According to Report No. FAA-EM-78-8A.

		Trail	Aircraft	Class
		В	C	
Lead	В	1.9	1.9	1.9
Aircraft	С	1.9	1.9	1.9
Class	D	3.6	3.6	2.7

Departure-Departure Separations (seconds)

1. VFR: According to Report No. FAA-EM-78-8A.

		Trail	Aircraft	Class
		В	С	C
Lead	В	60	60	60
Aircraft	C	60	60	60
Class	D	120	120	90

Departure-Arrival Separation (n.m.):

To be based on reduced field data, departure runway occupancy times, and discussions with ATC personnel.

Arrival-Departure Separation (seconds):

To be based on reduced field data arrival runway occupancy times and discussions and ATC personnel.

- 19. Route Data: See Figure 2.
- 20. Two-Way Path Data: 261, 267.

21. Common Approach Paths:

Aircraft Class	Length of Common Approach Path-VFR		
A	2.0		
В	3.0		
С	6.0		
מ	6.0		

22. Vectoring Delays:

A PARTY OF THE PROPERTY OF THE PARTY OF THE

This input allocates delays between vectoring and holding. Model input values will be used that hold arrival aircraft if delays to arrival aircraft exceed 15 minutes.

23. Departure Runway Queue Control:

Aircraft are assigned departure runways to preclude airspace crossovers, not to balance departure queues.

24. Gate Hold Control:

Aircraft are held at gates when departure queue at runway is 20 or more, except when gate holds would cause gate congestion.

25. Departure Airspace Constraints:

Aircraft are not held at gates due to departure airspace constraints.

26. Inter-Arrival Gap:

With this runway use, 4L arrivals are closed down when departure delays on 4L exceed 10 minutes. Thus a very large interarrival gap is inserted when this trigger is reached.

27. Runway Crossing Delay Control:

Arrival and departure runway operations are only interrupted for a tzxiing aircraft to cross an active runway when the taxiing aircraft is delayed by 20 minutes or more.

D. AIRCRAFT OPERATIONAL CHARACTERISTICS

28. Exit Taxiway Utilization:

			Exit Utilization (Percent)		
		Class	H	G	_Z_
Runway	4 L	В	61	39	0
		С	0	45	55
		D	0	14	86
				Utiliz Percer	
		Class	F	FA	32
Runway	4R	В	17	33	50
		С	7	37	57
		D	Ō	13	87

29. Arrival Runway Occupancy Times:

			Runway	Occupancy (Seconds)	Times
		Class	H	G	Z
Runway	4L	В	40	51	_
_		С	-	45	48
		D	-	48	55
			Runway	Occupancy (Seconds)	Times
		Class	F	FA	32
Runway	4R	В	33	45	54
_		С	32	37	50
		D	_	42	50

30. Touch & Go Occupancy Times: Not applicable.

31. Departure Runway occupancy Times:

Aircraft	Runway	Occupancy Time (seconds)
Class	Mean	Standard Deviation
A	34	4
В	34	4
С	39	4
D	39	4

32. Taxi Speeds: To be based on calibration results.

33. Approach Speeds:

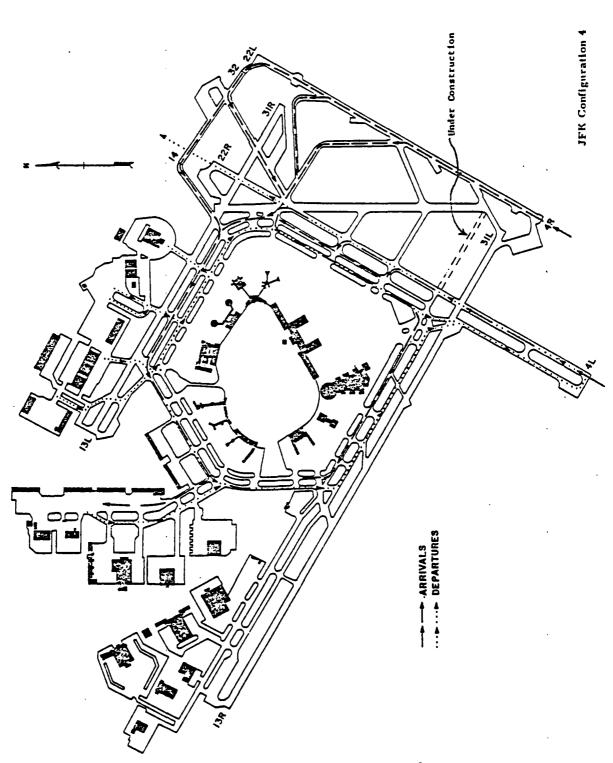
Aircraft		Approach	Speed	(knots)
Class	Mean		Standa	rd Deviation
В	120			10
C	130			10
D	140			10

34. Gate Service Times: Not applicable.

35. Airspace Travel Times: To be based on reduced field data.

36. Runway Crossing Times: To be based on reduced field data (20 seconds).

- 37. Lateness Distribution: To be determined by Task Force.
- 38. Demand: To be determined by Task Force.



TAXI ROUTES TO EXPERIMENT NO. 3

Figure 2

JFK STAGE - 1 EXPERIMENTS

Experiment No. 4

Objective:

To obtain baseline capacity estimates in IFR1 conditions for the following runway-use configurations:

Arrival Runways Departure Ruwways

4R

4L

Related Comparison Experiments:

Experiment 3, which is in VFR, has same runway-use configurations with 4L also used for arrivals and Experiment 18 has similar configurations but with 3-mile staggered arrivals.

(See attached change sheet)

OFK

Experiment Number 4 (Input changes from experiment number 3)

CIMILATION MODEL TUDES	DESCRIPTION OF THRUE CHANCE
SIMULATION MODEL INPUT	DESCRIPTION OF INPUT CHANGE
L Locistics	
1 Title	
2 Random number seeds	
3 Start and finish times	
4 Print options	
5 Airline names	
6 Processing options	
7 Gracetion Limits	
# Time switch	
b. Airfield Physical Characteristics	
9 Airdield network	
. 10 Number of sunsays	4L not used for arrivals
11 Survey identification	
12' Departure number and links	
13 Runway embasing links	
14 Exit taxiway location	No exit taxiways on 4L
15 Eolding areas	
l5 <u>Xirline</u> gates	
17 General aviation basing areas	
·	
c. ACC Procedures	
13 Aircraft Separations	IFRI Values
19 Route data .	No routes from 4L to gate areas
20 Two-way path data	
21 Common approach paths	IFR1 values
22 Vectoring delays	
23 Departure runway queue control	
24 Gate hold control.	
25 Departure airspace constraints	
26 Ceparture queue .	No trigger needed-no arrivals on 41
27 Runway crossing delay control	Only separations to next departure
	on Runway 4L, not next arrival
d. Aircraft Operational Characteristics	
28 Exit taxivay utilization	None on 4L
29 Arrival runway occupancy times	IFR1 Values
30 Touch-end-go Innway occupancy times	
11 Departure Timesy occupancy times	
32 Taxi speeds	
13 yhbratch speeds	IFR1 Values
34 Gate service times	
IS Airspace travel times	
16 Runway erossing times	
37 Lateness distribution	IFR1 Conditoins if different.
38 Consint	

JFK STAGE - 1 EXPERIMENTS

Experiment No. 18

Objective:

To provide estimates of the expected delay reduction associated with using 3-mile staggered separations on Runways 4L and 4R in less than visual conditions in periods of high arrival demand.

Related Comparison Experiments:

Experiment 3, a VFR1 experiment, has a similar runway configuragion, and Experiment 4 provides a direct comparison for this experiment.

(See attached change sheet)

Name and Advisory of the Party	
SIMULATION MODEL INPUT	DESCRIPTION OF INPUT CHANGE
a. Logistics	
1 mms	
. 2 Random number seeds	
3 Start and finish times	
4 Print options	
5 Airline names	
6 Processing options	
7 transaction limites	
8 Time switch	<u> </u>
b. Airfield Physical Curacteristics	
9 Airfield network	
. 10 Number of Funkeys	
Li Romway identification	
12' Departure runway and links	
13 Runway crossing links	
14 Exis taxivay location	
15 Holding areas	
15 Airline gates	
17 General aviation basing areas	
e. ACC Procedures	
18 Aircraft separations	IFR1 Values and 3-mile staggered seps.
19 Route data	
20 Two-way path data	
21 Common approach paths	IFR1 Values
22 Vectoring delays	
23 Departure runway queue control	
24 Gaza hold constrol.	
25 Departure airspace constraints	
26 Departure queue .	A higher trigger value for 4L
27 Runway erossing delay control	
d. Aircraft Operational Characteristics	
28 Trie taxiway utilization	
29 Arrival runway occupancy times	IFR1 Values
30 fouch-and-yo runway occupancy times	
31 Departure runway occupancy times	
32 Taxi speeds	IFR1 Values
33 Approach speeds 34 Gate service times	TINI VALUES
35 Airspace travel times	
, 36 Augusty crossing times	
17 Litaness distribution	IFR1 Condition if different.
38 3 44	TEAT CONDITION IT DIFFERE.
, 	

Experiment No. 5

Objective:

To obtain baseline delay estimates in VFR1 for the following runway-use configuration:

Arrival Runways Departure Runways

31L, 31R

31L

Related Comparison Experiments:

Experiment 16, also in VFR1, has same configuration but with short-range departures on 31R and independent departure tracks. Experiments 6 and 15 have the same basic runway-use configuration but in IFR1.

(See attached input data summary)

JFK INPUT DATA - EXPERIMENT NO. 5

A. LOGISTICS

- 1. <u>Title</u>: John F. Kennedy International Airport Airfield Simulation Model Run Exp.
- 2. Random Number Seeds: 2017, 3069, 4235, 5873, 6981, 7137, 8099, 9355, 0123, 1985.
- 3. Start and Finish Times: To be determined by Task Force.
- 4. Print Options: Detailed run for one random number seed. Summary run for ten random number seeds.

5.	Airline Names:	Name	Code
		Air Freight	AF
		Air Taxi	AT
		Allegheny	\mathtt{AL}
		American	AA
		Braniff	BN
		Delta	DL
		Eastern	EA
		Foreign International	FI
		National	NA
		Northwest	NW
		Pan American	PA
		Trans World	TW
		United	UA

- 6. Processing Options: First run to check model input. Other runs in COMPUTE mode.
- 7. Truncation Limits: + 3 standard deviations.
- 8. Time Switch: Not applicable.

B. AIRFIELD PHYSICAL CHARACTERISTICS

- 9. Airfield Network: See Figure 1.
- 10. Number of Runways: 2.
- 11. Runway Identification: 31L, 31R.
- 12. Departure Runway End Links: 109.

- 13. Runway Crossing Links: 242, 243.
- 14. Exit Taxiway Location: 194, 195, 196, 197, 238, 243.
- 15. Holding Areas: A dummy holding area will be used, as it does not apply to this run.
- 16. Airline Gates: Not applicable.
- 17. General Aviation Basing Areas: West of terminal area between Taxiways O and Q; area No. 13.

C. ATC PROCEDURES

18. Aircraft Separations:

Arrival-Arrival Separation (n.m.)

1. VFR: According to Report No. FAA-EM-78-8A.

		Trail	Aircraft	Class
		В	C	D
Lead	В	1.9	1.9	1.9
Aircraft	С	1.9	1.9	1.9
Class	D	3.6	3.6	2.7

Departure-Departure Separations (seconds)

2. VFR: According to Report No. FAA-EM-78-8A and previous capacity inputs.

		Trail	Aircraft	Class	
		В	C	C	
Lead	В	60	60	60	
Aircraft	C	60	60	60	
Class	D	120	120	90	

Departure-Arrival Separation (n.m):

To be based on reduced field data, departure runway occupancy times and discussions with ATC personnel.

Arrival-Departure Separation (seconds):

To be based on reduced field data, arrival runway occupancy times, and discussion with ATC personnel.

19. Route Data: See Figure 2.

20. Two-Way Path Data: 158, 159, 160, 161, 162, 163, 164,

165, 166, 184, 202, 220, 275.

21. Common Approach Paths:

Aircraft Class	Length of Common Approach Path
Α	2.0
В	3.0
С	6.0
D	6.0

22. Vectoring Delays:

This input allocates delays among vectoring and holding. Model input values will be used that hold arrival aircraft if delays to arrival aircraft exceed 15 minutes.

23. Departure Runway Queue Control:

Aircraft are assigned departure runways to preclude airspace crossovers, not to balance departure queues.

24. Gate Hold Control:

Aircraft are held at gates when departure queue at runway is 20 or more, except when gate holds would cause gate congestion.

25. Departure Airspace Constraints:

Aircraft are not held at gates due to departure airspace constraints.

26. <u>Inter-Arrival Gap</u>:

With this runway use, arrival aircraft on 31L are on 8-mi. separations in the arrival airspace when departure delays on 31L are significant, say 5 minutes.

27. Runway Crossing Delay Control:

Arrival and departure runway operations are only interrupted for a taxiing aircraft to cross an active runway when the taxiing aircraft is delayed by 10 minutes or more.

D. AIRCRAFT OPERATIONAL CHARACTERISTICS

28. Exit Taxiway Utilization:

			Exit Utilization (Percent)				
		Class	E	D	В	A	W
Runway	31R	A	100	0	0	0	0
_		B	61	39	0	0	0
		С	0	5	59	36	0
		D	0	4	37	53	6
			Exi	t Uti	lizat:	ion	
				(Perce	ent)		
		Class	L	M	N	PA	
Runway	31L	A	100	0	0	0	
_		В	17	33	50	0	
		С	7	33	57	3	
		D	0	16	47	37	

29. Arrival Runway Occupancy Times:

			Runy	vay Od	cupar Second		Lmes
		Class	E	<u>D</u>	В	<u>A</u>	W
Runway	31R	A	44	-	-	_	_
		В	40	51	-	-	_
		С	-	45	48	61	-
		D	-	48	55	65	72

				way Od		
		Class	<u>L</u>	M	N	PA
Runway	31L	A	35	-	-	_
_		B	33	45	54	-
		С	32	37	50	59
		D	-	42	50	61

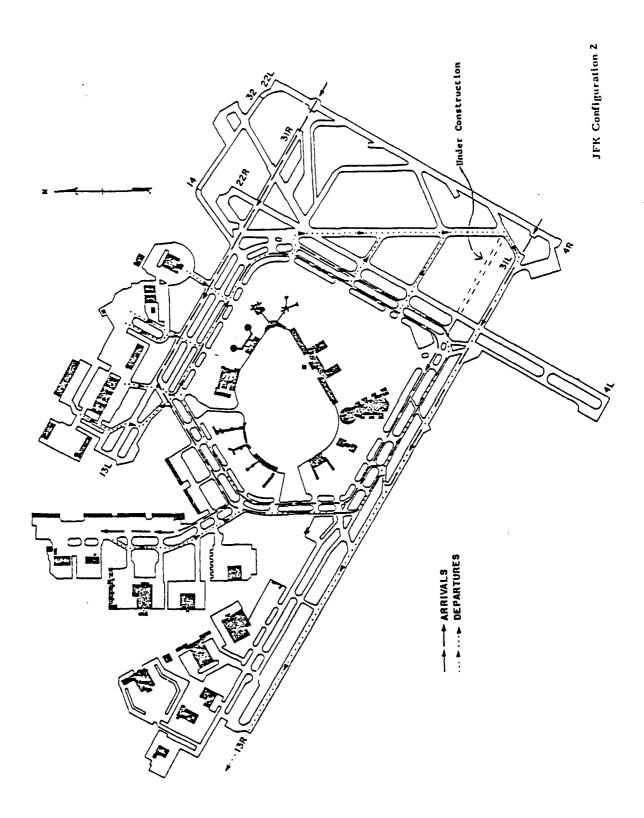
- 30. Touch & Go Occupancy Times: Not applicable.
- 31. Departure Runway Occupancy Times:

Aircraft	Runway Oc	cupancy Time (seconds)
Class	Mean	Standard Deviation
_		
A	34	4
В	34	4
С	39	4
D	39	4

- 32. Taxi Speeds: To be based on calibration results.
- 33. Approach Speeds:

Aircraft	App	roach Speed (knots)
Class	Mean	Standard Deviation
A	120	10
В	120	10
С	130	10
D	140	10

- 34. Gate Service Times: Not applicable.
- 35. Airspace Travel Times: To be based on reduced field data.
- 36. Runway Crossing Times: To be based on reduced field data (20 seconds).
- 37. Lateness Distribution: To be determined by Task Force.
- 38. Demand: To be determined by Task Force.



TAXI ROUTES FOR EXPERIMENT NO. 5 Figure 2

Experiment No. 16

Objective:

To investigate the potential benefits of independent departure tracks on runways 31L and 31R (31R used for short-range departures) in VFR1 conditions and the following runway-use configurations:

Arrival Runways Departure Runways

31L, 31R 31L, 31

Related Comparison Experiments:

The effect of the independent departures on 31L and 31R can be evaluated by comparing Experiment 16 with Experiment 5.

(See attached change sheet)

	1
SIMULATION MODEL INPUT	DESCRIPTION OF INPUT CHANGE
A. Logistics	
1 Timbe	
2 Random number seeds	
3 Start and finish times	
4 Print options	
5 Airline names	
6 Processing options	
7 Truncation limits	
1 Time switch	
b. Airfield Physical Characteristics	
9 Airfield network	
10 Number of Funways	R31R used for departures
11 Sumway identification	
12' Departure runway end links	R31R used for departures
ll Runway crossing links	
14 Exit taxivay location	
15 Holding areas	
16 Airline gates	
17 General aviation basing areas	
1	
c. ATC Procedures	
18 Aircraft separations	Mixed operations on both runways
19 Route data	departure routes to R31R
20 Two-way path data	ACMIT CATE TOACES TO VOLV
21 Common approach paths	
22 Vectoring delays	
23 Departure runway queue control	
24 Gate hold control	
25 Departure airspace constraints	
26 Departure queue	On both runways
27 Runway crossing delay control	
d. Aircraft Operational Characteristics	
28 Exit taxiway utilization	
29 Arrival runway occupancy times	
30 Touch-end-go runway occupancy times	
31 Departure runway occupancy times	Departures on R31R
32 Taxi speeds	
13 Approach speeds	
34 Gate service times	
35 Airspace travel times	
_ 16 Runvay crossing times	
17 Lateness distribution	
38 Demand	Short-range departures on P31R

Experiment No. 6

Objective:

To provide baseline delay estimates in IFR1 conditions, for the following runway-use configurations:

Arrival Runways Departure Runways

31R --

31L

Related Comparison Experiments:

Experiment 15 will have the same basic runway-use configurations in IFRl but with independent arrivals and independent departures on both R31R and R31L.

(See attached change sheet).

Experiment Number: 6 (Input changes from experiment number 5)

SIMULATION MODEL INPUT	DESCRIPTION OF INPUT CHANGE
4. Logistics	
1 mile	
2 Random number seeds	
3 Start and Simish times	
4 Print options	
5 Airline names	
6 Processing options	
7 Expession Linits	
8 Time switch	
•	
b. Airfield Physical Characteristics	
9 Airfield network	
. 10 Number of Funksys	Only Palp was from and
11 Removay identification	Only R31R used for arrivals
12 Departure runway end links	
13 Runway crossing links	
14 Exit taxivay location	Only on R31R
ls Holding areas	
16 Airline gates	
17 General aviation basing areas	
·	
e. ACC Procedures	
ls Aircraft separations	IFR1 Values
19 Route data	No routes from R31I to gates
ZS Two-way path data	
21 Common approach paths	IFR 'alues
22 Vectoring delays	
23 Departure runway queue control	
24 Gate hold control.	
25 Departure airspace constraints	
26 Departure queue 27 Emmyey crossing delay control	
. Mines Cossing Carry Control	
d. Aircraft Operational Characteristics	
28 Exit taxivay utilization	Nene en Daly
29 Astival runway occupancy times	None on R31L IFR1 Values
30 Truch-and-go runway occupancy times	
31 Departure runway occupancy times	IFR1 Values
32 Taxi speeds	
13 Approach speeds	IFR1 Values
34 Gate service times .	
35 Airspace travel times	
36 Augusty crossing times	
37 Laceness distribution	IFR1 Values if different
38 Cassag	No arrival assignments to R31L

Experiment No. 15

Objective:

To investigate the potential delay savings associated with having independent arrivals, independent departures, and independent missed approach tracks on Runways 31R and 31L in IFR1 conditions.

Related Compariosn Experiments:

Experiment 6 serves as the basis for evaluating the impact of the improvements in Experiment 15.

(See attached change sheet)

SIMULATION MODEL INPUT	DESCRIPTION OF INPUT CHANGE
& ingisties	
1 male	
2 Region matter saeds	·
3 Start and Sinish times	
4 Print options	
S Airlies asses	
6 Processing options	
7 Immestion Limits	
I Size sribbh	
b. Airtield Physical Curacteristics	
9 At-field network	
10 Remer of services	R31R also used for departures
Li Romay identification	KOIK AISO USED TOT DEPARTURES
12' Departure nursey and links	
11 Remay crossing links	
14 Exis taxing location	
15 Ending areas	
16 Airline gates	
17 General aviation basing arms	
ar delica delica perca aria	
c. ACC Procedures	
11 Aircraft separations	
19 Regia data	TFR1 Values P31R t P31L indep. R31R also used for departures
20 Two-way pach data	KOIK also used for departures
21 Common approach paths	
22 Vectoring delays	
23 Departure survey queue control	
24 Gate hold control.	
25 Departure sitspace constraints	
26 Ceparture queue	On both runways
27 Remyay emessing delay emetral	On Both Filaways
d. Airmant Coerational Characteristics	
28 Sets taxivay utilization	
29 Amiral remay occupancy times	IFR1 Values
30 South-end-to staves octabency times	
11 Departure runway occupancy times	IFRI Values, also for R31R
II Taxi speeds	
13 Approach speeds	IFR1 Values
34 Gaza sarries times .	
IS Airspace travel times	IFR1 Values
16 Neway crossing times	
17 Litaness distribution	IFR1 if different
18 Consed	Departure runway assignments to
	both 31L and 31R.

Experiment No. 7

Objective:

To obtain baseline delay estimates, in VFR1 conditions, for the following runway-use configuration:

Arrival Runway Departure Runways

13L, 13R

13R

Related Comparison Experiments:

Experiment 8 has the same basic runway-use configuration in IFRL conditions.

(See attached input summary)

JFK INPUT DATA - EXPERIMENT NO. 7

A. LOGISTICS

- 1. <u>Title</u>: John F. Kennedy International Airport Airfield Simulation Model Run
- Random Number Seeds: 2017, 3069, 4235, 5873, 6981, 7137, 8099, 9355, 0123, 1985.
- 3. Start and Finish Times: To be determined by Task Force.
- 4. Print Options: Detailed run for one random number seed. Summary run for ten random number seeds.

5.	Airline Names:	Name	Code
		Air Freight	AF
		Air Taxi	AΤ
		Allegheny	AL
		American	AA
		Braniff	BN
		Delta	DL
		Eastern	EA
		Foreign International	FI
		National	NA
		Northwest	NW
		Pan American	PA
		Trans World	TW
		United	UA

- 6. Processing Options: First run to check model input.
 Other runs in COMPUTE mode.
- 7. Truncation Limits: + 3 standard deviations.
- 8. Time Switch: Not applicable.

B. AIRFIELD PHYSICAL CHARACTERISTICS

- 9. Airfield Network: See Figure 1.
- 10. Number of Runways: 2.
- 11. Runway Identification: 13L, 13R.
- 12. Departure Runway End Links: 197.

JFK INPUT DATA - EXPERIMENT NO. 7

A. LOGISTICS

- 1. <u>Title</u>: John F. Kennedy International Airport Airfield Simulation Model Run
- 2. Random Number Seeds: 2017, 3069, 4235, 5873, 6981, 7137, 8099, 9355, 0123, 1985.
- 3. Start and Finish Times: To be determined by Task Force.
- 4. Print Options: Detailed run for one random number seed. Summary run for ten random number seeds.

5.	Airline 1	Names:	Name	Code
			Air Freight	AF
			Air Taxi	AT
			Allegheny	AL
			American	AA
			Braniff	BN
			Delta	$D\Gamma$
			Eastern	EA
			Foreign International	FI
			National	NA
			Northwest	NW
			Pan American	PA
			Trans World	TW
			United	UA

- 6. Processing Options: First run to check model input. Other runs in COMPUTE mode.
- 7. Truncation Limits: + 3 standard deviations.
- 8. Time Switch: Not applicable.

B. AIRFIELD PHYSICAL CHARACTERISTICS

- 9. Airfield Network: See Figure 1.
- 10. Number of Runways: 2.
- 11. Runway Identification: 13L, 13R.
- 12. Departure Runway End Links: 197.

- 13. Runway Crossing Links: 242, 243.
- 14. Exit Taxiway Location: 52, 163, 167, 187, 192, 193, 194, 195, 223, 226, 238.
- 15. Holding Areas: On Taxiway Z between Runways 4L-22R and 4R-22L; area No. 10.
- 16. Airline Gates: Not applicable.
- 17. General Aviation Basing Areas: West of terminal area between Taxiways O and Q; area No. 13.

C. ATC PROCEDURES

18. Aircraft Separations:

Arrival-Arrival Separation (n.m.)

1. VFR: According to Report No. FAA-EM-78-8A.

		Trail	Aircraft	Class
		В	С	D
Lead	В	1.9	1.9	1.9
Aircraft	С	1.9	1.9	1.9
Class	D	3.6	3.6	2.7

Departure-Departure Separations (seconds)

1. VFR: According to Report No. FAA-EM-78-8A.

		Trail	Aircraft	Class
		В	C	D
Lead	В	60	60	60
Aircraft	С	60	60	60
Class	D	120	120	90

Departure-Arrival Separation (n.m): To be based on reduced

field data, departure runway

occupancy times, and discussion with ATC

personnel.

Arrival-Departure Separation (seconds): To be based on

reduced field data,

arrival runway occupancy times, and

discussions with ATC personnel.

19. Route Data: See Figure 2.

20. Two-Way Path Data: 206, 207, 226, 239.

21. Common Approach Paths:

Aircraft Class	Length of Common Approach Path
A	2.0
В	3.0
С	6.0
D	6.0

22. Vectoring Delays:

This input allocates delays among vectoring and holding. Model input values will be used that hold arrival aircraft if delays to arrival aircraft exceed 15 minutes.

23. Departure Runway Queue Control:

Aircraft are assigned departure runways to preclude airspace crossovers, not to balance departure queues.

24. Gate Hold Control:

Aircraft are held at gates when departure queue at runway is 20 (15 in queue and 5 taxiing) or more, except when gate holds would cause gate congestion.

25. Departure Airspace Constraints:

Aircraft are not held at gates due to departure airspace constraints.

26. <u>Inter-Arrival Gap</u>:

With this runway use, arrival aircraft are delayed in the arrival airspace when departure delays exceed 20 minutes.

27. Runway Crossing Delay Control:

Arrival and departure runway operations are only interrupted for a taxiing aircraft to cross an active runway when the taxiing aircraft is delayed by 10 minutes or more.

D. AIRCRAFT OPERATIONAL CHARACTERISTICS

28. Exit Taxiway Utilization:

			Exit Utilization (Percent)						
	C	lass	В	D	E	Z	22R		
Runway	13L	B C D	61 0 0	39 5 4	0 59 37	0 36 53	0 0 6		
			Exit Utilization (Percent)						
		Class	N	M	L	K			
Runway	13R	B C D	17 7 0	33 33 16	50 57 47	0 0 37			

29. Arrival Runway Occupancy Times:

		1	Runway		upancy econds	Times
D	Class	B	D	E	Z	22R
Runway 13L	В	40	51	_	_	-
	С	-	45	48	61	-
~	D	-	48	55	65	72
			way Oc mes (S			
	Class	N	M	L	K	
Runway 13R	В	33	45	54	-	
	С	32	37	50	59	
	D	-	42	50	61	

30. Touch & Go Occupancy Times: Not applicable.

31. Departure Runway Occupancy Times:

Aircraft	Runway Oc	cupancy Time (seconds)
Class	Mean	Standard Deviation
A	34	4
В	34	4
С	39	4
D	39	4

32. Taxi Speeds: To be based on reduced field data.

33. Approach Speeds:

Aircraft		Approach	Speed	(knots)
Class_	Mean		Standa	rd Deviation
A	120			10
В	120			10
С	130			10
D	140			10

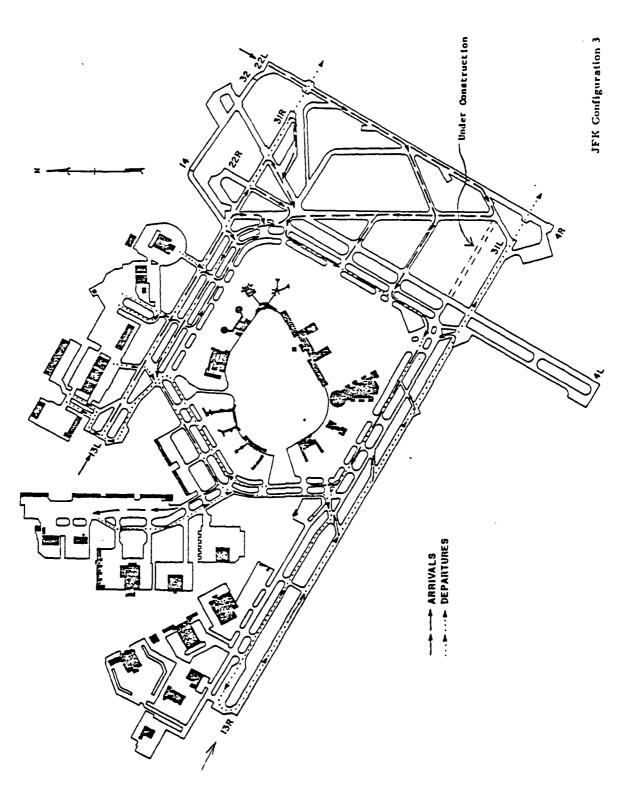
34. Gate Service Times: Not applicable.

35. Airspace Travel Times: To be based on reduced field data.

36. Runway Crossing Times: To be based on reduced field data (20 seconds).

37. Lateness Distribution: To be determined by Task Force.

38. Demand: To be determined by Task Force.



TAXI ROUTES--EXPERIMENT NO. 1 (Revision Under Development)

Figure 2

Experiment No. 8

Objective:

To obtain baseline capacity estimates, in IFR1 weather conditions, for the following runway-use configuration:

Arrival Runways Departure Runways

13L

13R

Related Comparison Experiments:

Experiment No. 7 has the same basic runway-use configurations but is in VFRl conditions.

(See attached change sheet)

SIMULATION MODEL INPUT	DESCRIPTION OF INPUT CHANGE
4 Logistics	
1 mele	
2 Randon number saeds	
I Start and finish times	
4 Print options	
S himling names	
6 Processing options	
7 Transation Limits	
8 Time switch	-
• July 3Walley	
h Madd 13 December 1 Character and the	
b. Airfield Physical Characteristics	
9 Airfield network	
. 10 Number of Final State	RI3R not used for arrivals in TFP1
11 Roway identification	
12' Departure runway and links	
13 Renway emossing links	
14 Exit taxiway location	None on R13R
15 Eolding arms	
15 <u>Aimline</u> gates	
17 General aviation besing arres	
<u> </u>	
e. ACC Procedures	
13 Alcomit separations	IFRI Values
19 Routs data .	None from R13R to gate areas
20 Tho-way path data	
Common approach paths	IFPL Values
22 Vectoring delays	
23 Departure runway queue control	
24 Gats hold control.	
25 Departure airspace constraints	
26 Ceparture queue	None on R13R
27 Remvay emossing dalay control	
d. Airmain Coeranional Characteristics	
28 Exis taxiway unilization	None on R13R
29 Actival runway occupancy times	IFR1 Values
30 Truch-end-go runway occupancy times	
31 Departure Finney occupancy times	IFRL Values if different
32 Taxi speeds	
33 yhinner sheers	IFR1 Values
J4 Gats service times	
15 Airspace travel times	
, J6 Sunvay crossing times	
17 Lateness distribution	for IFRl if different
31 Senior	no arrival assignments to R13R.

Attachment C

INPUT DATA SUMMARY STAGE 1 EXPERIMENTS

LaGuardia Airport

New York
Airport Improvement Task Force Delay Studies

Peat, Marwick, Mitchell & Co. San Francisco, California

August 1978

TABLE III-2 (REVISED)

LA GUARDIA DELAY EXPERIMENTS

Experiment Number	Model	Study Case ^a	Arrival Runways	Departure Runways	Weather	Demand	ATC System Scenario	Near-Term Improvements
Stage I Experiments								
1	ASM ^C	1	22	13	VFR1	1977	Today's	None
2	ASM	2	22	13	IFR1	1977	Today's	None
3	ASM	3	22	13	IFR2	1977	Today's	None
4	ASM	13	4	31	IFR2	1977	Today's	None
5	ASM	10	4	13	VFR1	1977	Today's	None
6	ASM	22	13	13	VFR1	1977	Today's	None
7	ASM	23	13	13	IFR1	1977	Today's	None
8	ASM	26	4	4	IFR1	1977	Today's	None
9	ASM	20	13	4	IFR1	1977	Today's	eć
10	ASM	23	13	13	IFRl	1977	Today's	£
10A	ASM	23b	13	13	IFRL	1977	Today's	g
11	ASM	3	22	13	IFR2	1977	Today's	h
12	ASM	2	22	13	IFRL	1977	Today's	i
13	ASM	26	4	4	IFRL	1977	Today's	i
19	ASM	1	22	13	VFRl	1977	Today's	j
20	ASM	3	22	13	IFR2	1977	Today's	j
14	ADM	n.a.	n.a.	n.a.	n.a.	1977	Today's	None

a. Study cases (combinations of runway use and weather conditions) and potential near-term improvements are identified in New York Airport Improvement Task Force Interim Report. The study cases are shown in Figure III-2. The potential improvements are identified in Appendix B.

b. FAA will describe impact of post-1982 ATC systems on model inputs.

c. Airfield Simulation Model.

d. Task Force will establish packages of near-term improvements most likely to be implemented in pre-1992 and post-1982 time frames.

Has improved airspace procedures and a high speed exit from Runway 13 to Taxiway O.

f. Relocates Runway 13 glide slope antenna to reduce critical zone impact.

g. Has LGA/TEB interaction.

h. Has ASDE.

i. Has improved taxiway network, including partial parallel to Runway 4.

Demand-delay relationship relating to impact of quota system alternatives.

LaGuardia Airport

INDEX OF STAGE 1 EXPERIMENTS

Sequence No.	Experiment No.	Study Case	<u>Model</u>	Typed Input Description	Page
1	1	1	ASM	Full	57
2	19	1	ASM	Changes	64
3	2	2	ASM	Changes	66
4	12	2	ASM	Changes	68
5	3	3	ASM	Changes	70
6	11	3	ASM	Changes	72
7	20	3	ASM	Changes	74
8	4	13	ASM	Full	76
9	5	16	ASM	Full	62
10	6	22	ASM	Full	88
11	7	23	ASM	Changes	94
12	10	23	ASM	Changes	96
13	10A	2 3 b	ASM	Changes	98
14	8	26	ASM	Full	100
15	13	26	ASM	Changes	106
16	9	20	ASM	Full	108
17	14	n.a.	ADM	Full	

Stage 1 experiments as presented in revised Table III but reorganized and grouped by like runway configuration.

LGA STAGE - 1 EXPERIMENTS

Experiment No. 1

Objective:

To provide baseline delay estimates, in VFR1 conditions, for the following runway-use configuration:

Arrival Runway Departure Runways

22

13

Related Comparison Experiments:

Experiment 19 has same runway-use configuration and weather conditions but a different aircraft mix, to reflect impact of quota system alternatives. Experiments, 2, 3, 11, 12, and 20 have the same basic runway-use configuration but different weather conditions.

Remaining Data Input Needs:

- o Time period to be simulated
- o Schedule inputs and lateness
 (distribution(s)

(See attached input data summary)

LGA INPUT DATA - EXPERIMENT 1

A. LOGISTICS

- 1. <u>Title</u>: LaGuardia Airport Airfield Simulation Model Stage-1 Run
- 2. Random Number Seeds: 2017, 3069, 4235, 5873, 6981, 7137, 8099, 9355, 0123, 1985.
- 3. Start and Finish Times: To be determined by Task Force.
- 4. Print Options: Detailed run for one random number seed. Summary run for ten random number seeds.

5.	Airline Names:	Name	<u>Code</u>
		Air Taxi	AT
		Allegheny	AL
		American	AA
		Braniff	BN
		Delta	DL
		Eastern	EA
		National	NA
		North Central	NC
		Northwest	NW
		Ozark	OZ
		Piedmont	PI
		Southern	SO
		Trans World	TW
		United	UA

- 6. Processing Options: First run to check model input. Other runs in COMPUTE mode.
- 7. Truncation Limits: + 3 standard deviations.
- 8. Time Switch: Not applicable.

B. AIRFIELD PHYSICAL CHARACTERISTICS

- 9. Airfield Network: See Figure 1.
- 10. Number of Runways: 2
- 11. Runway Identification: 22, 13.

- 12. Departure Runway End Links: 50, 114
- 13. Runway Crossing Links: 58, 82, 85, 86
- 14. Exit Taxiway Location: 77, 78, 80, 81, 178, 179
- 15. Holding Areas: 44, 45, 46, 49
- 16. Airline Gates: Gate Areas are used.
- 17. General Aviation Basing Areas: West of terminal area, 48.

C. ATC PROCEDURES

18. Aircraft Separations: These values are based on Report No. FAA-EM-78-8A.

Arrival-Arrival Separation (n.m.)

		Trail	L Aircı	raft C	lass
		A	В	С	D
Lead	Α	1.9	1.9	1.9	1.9
Aircraft	В	2.7	1.9	1.9	1.9
Class	С	2.7	1.9	1.9	1.9
	D	4.5	3.6	3.6	2.7

Departure-Departure Separations (seconds)

		Trail	. Airci	raft	<u>Class</u>
		A	В	С	<u>D</u>
Lead	A	35	45	45	50
Aircraft	В	50	60	60	60
Class	С	50	60	60	60
	D	120	120	120	90

The following values are based on reduced field data and previous capacity studies.

Departure-Arrival Separation (n.m.): 0.4 miles

Arrival-Departure Separation (seconds): 10 seconds

- 19. Route Data: See Figure 2.
- 20. Two-Way Path Data: To be determined during detailed network coding.

21. Common Approach Paths:

Aircraft Class	Length of Common Approach Path
A	2.0
В	3.0
С	6.0
D -	€.0

22. Vectoring Delays:

This input allocates delays among vectoring and holding. Model input values will be used that hold arrival aircraft if delays to arrival aircraft exceed 12 minutes.

- 23. Departure Runway Queue Control: Not applicable.
- 24. Gate Hold Control: Not applicable.

25. Departure Airspace Constraints:

Aircraft are held at gates due to lack of real estate not departure airspace constraints.

26. Inter-Arrival Gap:

With this runway use, arrival aircraft are delayed in the arrival airspace when departure delays exceed 20 minutes.

27. Runway Crossing Delay Control:

Arrival and departure runway operations are only interrupted for a taxiing aircraft to cross an active runway when the taxiing aircraft is delayed by 30 minutes or more.

D. AIRCRAFT OPERATIONAL CHARACTERISTICS

28. Exit Taxiway Utilization:

		Exit	Utili:	zation	(pe:	rcent)
	Class	F	Ď	C	В	A
Runway 22	A	100	0	0	0	0
_	В	57	0	43	0	0
	С	0	6	58	36	0
	D	0	0	9	72	19

29. Arrival Runway Occupancy Times:

			Runway		Occupany Times (seconds)			
		Class	F	D	<u>c</u>	В	A	
Runway	22	A	40	_	_	_	_	
		B	42	_	48	-	-	
		С	_	41	44	52	_	
		D	_	_	47	58	64	

30. Touch & Go Occupancy Times: Not applicable.

31. Departure Runway Occupancy Times:

Aircraft	Runway Occi	pancy Time (seconds)		
<u>Class</u>	Mean	Standard Deviation		
A	34	4		
В	34	4		
С	39	4		
D	39	4		

32. Taxi Speeds: To be based on calibrated model.

33. Approach Speeds:

Approach	Speed (knots)
Mean	Standard Deviation
110*	10
120	10
130	10
140	10
	Mean 110* 120 130

*120 knots in IFR.

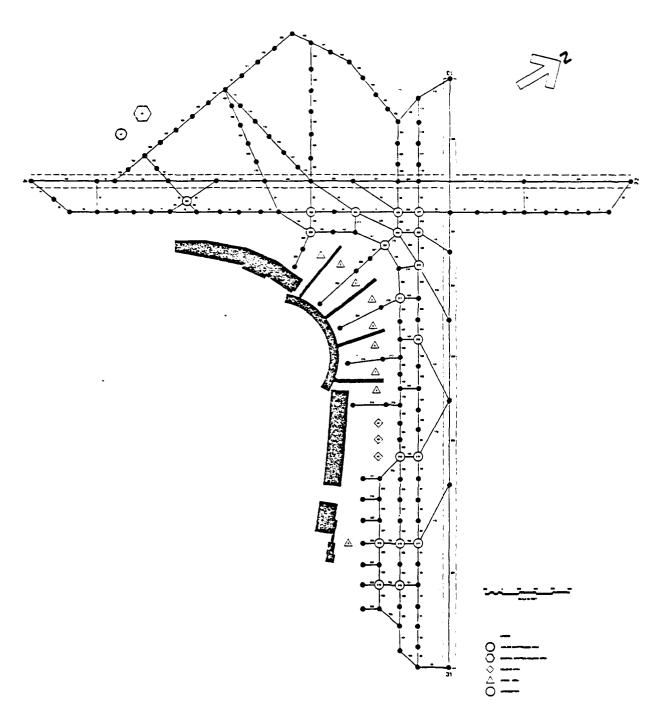
34. Gate Service Times: Not applicable.

35. Airspace Travel Times: To be based on calibrated model.

36. Runway Crossing Times: 20 seconds.

37. Lateness Distribution: To be determined by Task Force.

38. <u>Demand</u>: To be determined by Task Force.



AIRFIELD NETWORK
LA GUARDIA AIRPORT

Figure 1

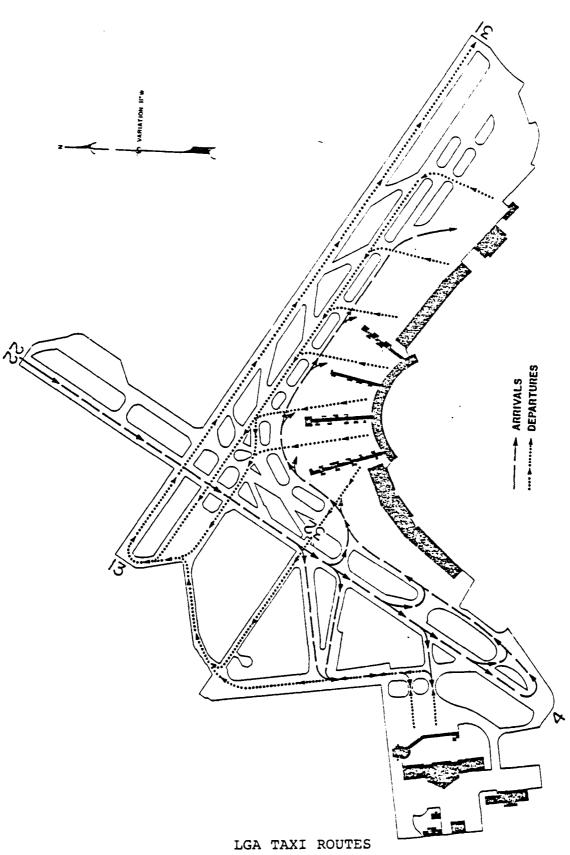


Figure 2

LGA STAGE - 1 EXPERIMENTS

Experiment No. 19

Objective:

To evaluate the impact in VFRl conditions of case-sepcific observed (1977) aircraft mix that differs from the FAR-93 mix used in the baseline capacity experiments.

Related Comparison Experiments:

The impact will be evaluated by comparison with results of Experiment No. 1.

Remaining Data Input Needs:

The input schedule must reflect the quota mix, i.e., it must assume that FAR-93, Subpart K, quota, is enforced.

(See attached change sheet).

	······································
SIMULATION MODEL INPUT	DESCRIPTION OF INPUT CHANGE
4. Legistics .	
l male	
2 Ractics sucher seeds	·
3 Start and Simish times	
4 Prime options	
5 Airline names	
6 Processing Options	
7 Securion Linits	
I man svinsk	
b. Airtiald Physical Couragnosticates	
3 Airfield network	
. 10 Rumber of purveys	
Li Emay identification	
12' Dapartura runway and links	
13 Romay conssing links	
14 Iris taxinay location	
23 Holding arous	
15 Airline gates	
17 General aviation basing arras	
E. ALL PRODUCTS	
11 Alberti separations	
15 Acces data	.
23 Tho-way park data	
77 Common spinsonery hearys	
22 Vectoring delays	
13 Separation surpeys diverse control	
24 Gara bold exercial.	
22 Caparture sittipace constraints	
25 Caparture queue .	
27 Removaly crossing dalay control	
d. Airmit Geneimal Camenaristics	
25 This tariway utilization	
29 Amiral runway community times	
10 Truch-end-yo ranway company times	
IL Department remany contentury times	
II fire specie	
11 Yahaares shoops	1
34 Gata service times	
15 Altropace stavel times	
37 Liteness distribution	
28 Secret	Must reflect FAR-93, Subpart K, quota.

LGA STAGE - 1 EXPERIMENTS

Experiment No. 2

Objective:

To obtain baseline delay estimates in IFR1 weather conditions, for the following runway-use configuration:

Arrival Runways Departure Runways

22

13

Related Comparison Experiments:

Experiment No. 12 is for the same runway-use and weather, but it involves an improved taxiway network west of R4/22 and a partial parallel to Runway 4.

(See attached change sheet).

Experiment Number: 2 (Input changes from experiment number 1)

SIMULATION MODEL INPUT	DESCRIPTION OF INPUT CHANGE
L Legistics .	
1 mile	
2 Random Runner Seeds	·
3 Stage and finish times	
4 Price options	
5 Airling times	
6 Processing options	1.
7 Errossias Linias	1
1 Time switch	
b. Airfield Physical Currentstics	
3 Airdiald named	
. 13 Rumber of Immays	
Li Browy identification	
12' Departure runway and links	
13 Removey crossing Links	
14 Ext: turiway location	
15 Eolding arms	
15 limine gates	
17 General aviation basing arras	
e. ACT Procedures	
13 Airmait separations	IFR Values
13 Rents data	
25 Two-way path data	
21 Comma approach paths	IFR! Values
22 Vectoring delays	A DE VOLUES
22 Separates remay queue control	
24 Gaza bold control.	
22 Caparines alespace constitues	
28 Separtite queue .	
27 Servey crossing dalay control	
4. Airmit Ceratical Curacturatica	
28 Date taxinay unilination	
29 Arrival remyay occupancy times	IFR1 Values
30 Truch-end-to remay company times	
Il Departure Fluvey occupancy times	
II Tax, speeds	
32 Approach speeds	IFRL Values
34 Gate service times	
IS Airspace travel times	
16 Augusty crossing times	
37 Liteness distribution	IFR1 (if different)
33 Censor	

LGA STAGE - EXPERIMENTS

Experiment No. 12

Objective:

To evaluate the impact of an improved taxiway network west of R4/22 and a partial parallel to Runway 4.

Related Comparison Experiments:

Experiment 2 serves as the baseline case to evaluate this experiment.

Remaining Data Items:

A way must be found to circumvent the fact that the model assumes one and only one path from gate to departure-runway end.

(See attached change sheet).

Experiment Number: 12 (Input changes from experiment number 1)

SIMULATION MODEL INPUT	DESCRIPTION OF INPUT CHANGE
1 male	
I	
2 Random number seeds	
1 Start and finish times	
4 Print options	
S Airline names	
6 Processing options	
7 Securior Linits	
1 Zim switch	
h. Mitteld Provide Cummeristics	
9 Airdiald retwork	Improved taxiway network
. 10 Remoter of standard	
11. Romay identification	
12' Departure survey and links	
13 Removey consisting links	
14 Init turiny location	
15 Holding arms	
is Aimline gates	
17 General ariaries basing areas	
c. All Procedures	
li Airmait separations	IFRl Values
19 Roots tata .	
22 Chowsy pach data	
Comme approace parker	TERL Values
T Vectoring delays	
53 Separate lanes dance andaral	
24 Gaza bold exercial.	
25 Capartura airopaes constraints	
26 Ceparture queue .	Improved Taxiway Network
27 Servey crossing delay control	
d. Airmit Germani Carametria	
28 Swig taxiway utilization	
29 Amiral remay company times	IFR1 Values
30 fructi-end-yo runway commpany times	
IL Separtura runway occupancy times	
II faxi speeds	
12 Approach speeds	IFRL Values
34 Gaza sarvice times .	
25 Airspace travel times	
, J& Municary extensions times	
J. Liteages Cittibution	IFR1 (if different)
33 January	Must circumvent one-taxi-out-path
	problem.

LGA STAGE - 1 EXPERIMENTS

Experiment No. 3

Objective:

To obtain baseline delay estimates, in IFR2 weather conditions, for the following runway-use configurations:

Arrival Runways Departure Runways

22

13

Related Comparison Experiments:

(See attached change sheets).

Experiments 11 and 20 have same conditions.

Experiment Number: 3 (Input changes from experiment number 1)

SIMULATION MODEL INPUT	DESCRIPTION OF INPUT CHANGE
4 lectories .	
1 24213	
2 Random number seeds	
3 Store and finish times	
4 Print options	
5 Airline rames	
6 Panessing options	
7 Secretaries Links	
1 time section	
b. Airlield Province Cameroristing	
9 Airfield nament	
. 10 Number of Junearys	
L Emmay identification	
12' Departure Turney and links	
13 Survey crossing links	
14 Init taxing location	
15 Holding areas	
lS limine gates	
17 General aviation basing areas	
<u> </u>	
८. १६६ रिक्स्ट्रिक्स	
li kirmait sepesatións	IFR2 Values
25 Route data	
20 thomay path data	
21 Command packs	IFR2 Values
22 Vectoring delays	
23 Departure runney queue control	
24 Gats hold control.	
25 Canadana disapada constraines	
25 Caparine queue .	ļ
27 Removey crossing delay control	
4. Airmait Coessional Characteristics	
23 Data taxing utilization	
29 Arrival rumbay company times	IFR2 Values
30 Trush-sad-ye ranway company times	
IL Desagnes remote description times	
22 Taxa specie	
23 Approach speeds	IFR2 Values
24 Gats service times .	
15 Alexander Wavel times	
, _ 26 Amenay eresains times	
17 Litagous Cistribution	For IFR2 (if different)
38 Consed	For IFR2 (if different)

LGA STAGE - 1 EXPERIMENTS

Experiment No. 11

Objective:

To evaluate effect of ASDE on delay estimates for IFR2 conditions.

Related Comparison Experiments:

Experiment 3 has the same conditions but with no ASDE improvement.

Remaining Data Items:

Must quantify effect of ASDE on departure releases.

(See attached change sheet)

SIMULATION MODEL INPUT	DESCRIPTION OF INPUT CHANGE
& Leciation .	1
l mala	
2 Random number seeds	
3 Start and finish times	
4 Print options	
5 Multing names	
6 Processing options	
7 Symmetries limits	
I time switch	
b. Airfield Physical Caracteristics	
. At-Haid respons	
2. 10 Rember of surveys	
Li Promay identification	
12' Departure runway and links	
13 Reseay crossing links	
U Int turing location	
15 Holding arms	
15 Airline gates	
LT General aviation basing areas	
c. ATT Procedures	
11 Airmait separations	IFR2 Separations
13 Rents data	Reflect effect of ASDE
20 Thoway path data	
21 Compan approach paths	TER2 Values
22 Vectoring delays	1.53.4
23 Capazines survey queue control	Reflect effect of ASDE
IA Gats bold control.	Reflect effect of ASDE
25 Dapartura airryaca constraints	
16 Capartite queva .	Reflect effect of ASDE
17 Revay crossing dalay control	Reflect effect of ASDE
d. Airmait Corretional Characteristics	
II Init taxiway utilization	
29 Actival runway occurrancy times	IFR2 Values
30 Truck-and-to runway occupancy times	
II Department runway community times	!
22 Taxi speeds	
13 Approach speeds	JFR2 Values
34 Gats sarries times .	
25 Airspace wavel times	
17 Lateness distribution	
18 Second	For IFR2 (if different)
	For IFR2 (if different)

LGA STAGE - 1 EXPERIMENTS

Experiment No. 20

Objective:

To evaluate effect of quota mix in IFR2 conditions -- see Experiment No. 19.

Related Comparison Experiments:

Experiment 3 is the baseline case; Experiment 19 is similar but in VFR1 conditions.

(See attached change sheet).

Experiment Number: 20 (Input changes from Experiment number 3)

SIMULATION MODEL INPUT	DESCRIPTION OF INPUT CHANGE
4 <u>isticula</u>	
1	
2 Zandra Burber Seeds	
2 Starm and finish wines	
4 7mins options	
5 Aintine names	
6 Processing options	1
7 Semestion Limits	<u> </u>
1 Time switch	
b. Airdield Physical Characteristics	
3 At-Hald Servery	
. 20 Number of runways	
11 Among identification	
12' Departure runway and links	
13 Runway crossing links	
14 Emit turinay location	
15 Zalding areas	
15 Airline gates	
17 Gameral aviation basing arras	
S. ANY Procedures	
22 Airmait separations	
15 Routs data	
22 Thomey path data	
21 Common approvact paths	
22 Vectoring delays	
22 Caparine Timesy queue control	
24 Gata hold enemal.	
25 Departure airrepass constraines	
26 Capartine queue .	
27 Removey embessing delay constrol	
d Nigranda Caramaiana) day	
d. Microsit Coerational Characteristics 28 Exit testing utilization	
29 Amiral rammay company times	
30 Truck-end-yo Travey company times	
IL Department runnery community times	
II fixi speeds	
13 Approach speeds	
34 Gats service times .	
IS Alexander travel times	
16 Number crossing times	
if Litaness distribution	
35 Sensed	Mark and Co.
	Must reflect FAR-93, Subpart K,
· · · · · · · · · · · · · · · · · · ·	

LGA STAGE 1 EXPERIMENTS

Experiment No. 4

Objective:

To obtain baseline delay estimates, in IFR2 conditions, for the following runway-use configuration:

Arrival Runways Departure Runways

4

31

Related Comparison Experiments

None in Stage-1; possible Stage-2 experiment.

Remaining Data Items

- o Schedule with runway assignments
- o Additional separation added for safety assurance due to wind shear, etc.

(See attached input summary).

LGA INPUT DATA - EXPERIMENT NO. 4

A. LOGISTICS

- 1. <u>Title</u>: LaGuardia Airport Airfield Simulation Model Stage-1 Run
- 2. Random Number Seeds: 2017, 3069, 4235, 5873, 6981, 7137, 8099, 9355, 0123, 1985.
- 3. Start and Finish Times: To be determined by Task Force.
- 4. Print Options: Detailed run for one random number seed.
 Summary run for ten random number seeds.

5.	Airline	Names:	Name	Code
			Air Taxi	ΑT
			Allegheny	\mathtt{AL}
			American	AA
			Braniff	BN
			Delta	DL
			Eastern	EΑ
			National	NA
			North Central	NC
			Northwest	NW
			Ozark	ΟZ
			Piedmont	PI
			Southern	SO
			Trans World	TW
			United	UA

- 6. Processing Options: First run to check model input.
 Other runs in COMPUTE mode.
- 7. Truncation Limits: + 3 standard deviations.
- 8. Time Switch: Not applicable.

B. AIRFIELD PHYSICAL CHARACTERISTICS

9. Airfield Network: See Figure 1.

Number of Runways: 2

nway Identification: 4, 31.

- 12. Departure Runway End Links: 88.
- 13. Runway Crossing Links: 110, 152, 167, 179.
- 14. Exit Taxiway Location: 50, 83, 84, 87.
- 15. Holding Areas: 44, 45, 46, 49.
- 16. Airline Gates: Gate Areas Used.
- 17. General Aviation Basing Areas: West of terminal area, 48.

C. ATC PROCEDURES

18. Aircraft Separations: These values are based on Report No. FAA-EM-78-8.

Arrival-Arrival Separation (n.m.) - IFR Without Buffer

		<u>Trail</u>	Airc	raft C	lass
		A	В	_ <u>C</u> _	D
Lead			3.0	3.0	3.0
Aircraft	В	4.0	3.0	3.0	3.0
Class	С	4.0	3.0	3.0	3.0
	D	6.0	5.0	5.0	4.0

Departure-Departure Separations (seconds) - Peculiar to this Experiment and Location

		Trail	Airc	raft C	lass
		A	В	C	D
Lead	A	60	60	90	94
Aircraft	В	60	60	60	64
Class	С	60	60	60	64
	D	120	120	120	90

Departure-Arrival Separation (n.m.): 2.4 - 2.8 miles, larger values behind smalls

Arrival-Departure Separation (seconds): 47 seconds except 51 seconds behind smalls

- 19. Route Data: See Figure 2.
- 20. Two-Way Path Data: To be based on detailed network coding.

21. Common Approach Paths:

Aircraft Class	Length of Common Approach Path
A	6.0
В	6.0
С	6.0
D	6.0

22. Vectoring Delays:

This input allocates delays among vectoring and holding. Model input values will be used that hold arrival aircraft if delays to arrival aircraft exceed 12 minutes.

- 23. Departure Runway Queue Control: Not applicable.
- 24. Gate Hold Control: Not applicable.

25. Departure Airspace Constraints:

Aircraft are not held at gates due to departure airspace constraints.

26. Inter-Arrival Gap:

With this runway use, arrival aircraft are delayed in the arrival airspace when departure delays exceed 20 minutes.

27. Runway Crossing Delay Control:

Arrival and departure runway operations are only interrupted for a taxiing aircraft to cross an active runway when the taxiing aircraft is delayed by 30 minutes or more.

D. AIRCRAFT OPERATIONAL CHARACTERISTICS

28. Exit Taxiway Utilization:

		Exit U	Jtiliza	tion (p	ercent)
	<u>Class</u>	F	Q	RR	R
Runway 4	A	100	0	O	0
	B	57	0	43	0
	C	0	6	58	36
	D	0	0	28	72

29. Arrival Runway Occupancy Times:

			Runw		upany 'conds)	Times
		Class	F	Q	RR	R
Runway	4	Α	40	_	-	_
		В	42	-	48	-
		С	-	41	44	52
		D	_	-	47	58

- 30. Touch & Go Occupancy Times: Not applicable.
- 31. Departure Runway Occupancy Times:

Aircraft	Runway Occu	pancy Time (seconds)
Class_	Mean	Standard Deviation
A	34	4
В	34	4
С	39	4
D	39	4

- 32. Taxi Speeds: To be based on reduced field data.
- 33. Approach Speeds:

Aircraft	A	oproach Speed (knots)
<u>Class</u>	Mean	Standard Deviation
A	120	10
В	120	10
С	130	10
D	140	10

- 34. Gate Service Times: Not applicable.
- 35. Airspace Travel Times: To be based on reduced field data and calibrated model.
- 36. Runway Crossing Times: 20 seconds or more if different in IFR2.
- 37. Lateness Distribution: To be determined by Task Force.
- 38. Demand: To be determined by Task Force.

Figure 2 (Under Development)

LGA STAGE - 1 EXPERIMENTS

Experiment No. 5

Objective:

To obtain baseline delay estimates, in VFR1 conditions, for the following runway-use configuration:

Arrival Runways Departure Runways

13

Related Comparison Experiments:

4

None directly in Stage-1; possible in Stage-2.

(See attached input summary).

LGA INPUT DATA - EXPERIMENT NO. 5

A. LOGISTICS

- 1. <u>Title</u>: LaGuardia Airport Airfield Simulation Model Stage-1 Run
- 2. Random Number Seeds: 2017, 3069, 4235, 5873, 6981, 7137, 8099, 9355, 0123, 1985.
- 3. Start and Finish Times:
- 4. Print Options: Detailed run for one random number seed. Summary run for ten random number seeds.

5.	Airline Names:	<u>Name</u>	Code
		Air Taxi	AT
		Allegheny	AL
		American	AA
		Braniff	BN
		Delta	DL
		Eastern	EA
		National	NA
		North Central	NC
		Northwest	NW
		Ozark	OZ
		Piedmont	ΡĪ
		Southern	SO
		Trans World	TW
		United	UA

- 6. Processing Options: First run to check model input. Other runs in COMPUTE mode.
- 7. Truncation Limits: + 3 standard deviations.
- 8. Time Switch: Not applicable.

B. AIRFIELD PHYSICAL CHARACTERISTICS

- 9. Airfield Network: See Figure 1.
- 10. Number of Runways: 2
- 11. Runway Identification: 4, 13.

- 12. Departure Runway End Links: 114.
- 13. Runway Crossing Links: 82, 83, 85, 86.
- 14. Exit Taxiway Location: 50, 83, 84, 87
- 15. Holding Areas: 44, 45, 46, 49
- 16. Airline Gates: Using Gate Areas.
- 17. General Aviation Basing Areas: West of term nal area, 48.

C. ATC PROCEDURES

18. Aircraft Separations: These values are based on Report No. FAA-EM-78-8A.

Arrival-Arrival Separation (n.m.) - VFR

		Trail	Airc	raft C	lass
		A	В	С	D
Lead	A	1.9	1.9	1.9	1.9
Aircraft	В	2.7	1.9	1.9	1.9
Class	С	2.7	1.9	1.9	1.9
	D	4.5	3.6	3.6	2.7

Departure-Departure Separations (seconds)

		Trail	Airc	raft	Class
		A	В	С	D
Lead	A	35	45	45	50
Aircraft	В	50	60	60	60
Class	С	50	60	60	60
	D	120	120	120	90

Departure-Arrival Separation (n.m.): 0.25 miles

Arrival-Departure Separation (seconds):

10 seconds behind small, 22 seconds behind large, and 47 seconds behind heavies.

- 19. Route Data: See Figure 2.
- 20. Two-Way Path Data: To be based on detailed network coding.

21. Common Approach Paths:

Aircraft Class	Length of Common Approach Path
A	2.0
В	3.0
С	6.0
D	6.0

22. Vectoring Delays:

This input allocates delays among vectoring and holding. Model input values will be used that hold arrival aircraft if delays to arrival aircraft exceed 12 minutes.

- 23. Departure Runway Queue Control: Not applicable.
- 24. Gate Hold Control: Not applicable.

25. Departure Airspace Constraints:

Aircraft are not held at gates due to departure airspace constraints.

26. Inter-Arrival Gap:

With this runway use, arrival aircraft are delayed in the arrival airspace when departure delays exceed 20 minutes.

27. Runway Crossing Delay Control:

Arrival and departure runway operations are only interrupted for a taxiing aircraft to cross an active runway when the taxiing aircraft is delayed by 30 minutes or more.

D. AIRCRAFT OPERATIONAL CHARACTERISTICS

28. Exit Taxiway Utilization:

		Exit (Jtiliza	tion (percent)
	Class	_F_	Q	RR	R
Runway 4	A	100	0	0	0
-	В	57	0	43	0
	С	0	6	58	36
	D	0	0	28	72

29. Arrival Runway Occupancy Times:

		Runway Occupany Tim (seconds)			
	Class	F	Q	RR	R
Runway 4	A	40	_	-	_
	В	42	-	48	-
	С	-	41	44	52
	D	-	-	47	58

30. Touch & Go Occupancy Times: Not applicable.

31. Departure Runway Occupancy Times:

Aircraft	Runway Occi	Runway Occupancy Time (seconds)			
Class	Mean	Standard Deviation			
A	34	4			
В	34	4			
С	39	4			
D	39	4			

32. Taxi Speeds: To be based on reduced field data.

33. Approach Speeds:

Aircraft	Ar	proach Speed (knots)
Class	Mean	Standard Deviation
A	110	10
В	120	10
С	130	10
D	140	10

34. Gate Service Times: Not applicable.

35. Airspace Travel Times: To be based on reduced field data.

36. Runway Crossing Times: 20 seconds.

37. Lateness Distribution: To be determined by Task Force.

38. Demand: To be determined by Task Force.

Figure 2
(Under Development)

LGA STAGE - 1 EXPERIMENTS

Experiment No. 6

Objective:

To obtain baseline delay estimates, in VFR1 conditions, for the following runway-use configurations:

Arrival Runways Departure Runways

13

Related Comparison Experiments:

13

Experiments 7, 10, and 10A have same runway-use, but they different weather, namely IFR1 and improvements. Is the glide-slope, critical-zone impact reflected in this experiment (?) or just in IFR?

(See attached input summary).

LGA INPUT DATA - EXPERIMENT NO. 6

A. LOGISTICS

- 1. <u>Title</u>: LaGuardia Airport Airfield Simulation Model Stage-1 Run
- 2. Random Number Seeds: 2017, 3069, 4235, 5873, 6981, 7137, 8099, 9355, 0123, 1985.
- 3. Start and Finish Times: To be determined by Task Force.
- 4. Print Options: Detailed run for one random number seed. Summary run for ten random number seeds.

5.	Airline Names:	Name	Code
		Air Taxi	AT
		Allegheny	\mathtt{AL}
		American	AA
		Braniff	BN
		Delta	\mathtt{DL}
		Eastern	EA
		National	NA
		North Central	NC
		Northwest	NW
		Ozark	OZ
		Piedmont	PI
		Southern	SO
		Trans World	TW
		United	UA

- 6. Processing Options: First run to check model input.
 Other runs in COMPUTE mode.
- 7. Truncation Limits: + 3 standard deviations.
- 8. Time Switch: Not applicable.

B. AIRFIELD PHYSICAL CHARACTERISTICS

- 9. Airfield Network: See Figure 1.
- 10. Number of Runways: 1
- 11. Runway Identification: 13

- 12. Departure Runway End Links: 114
- 13. Runway Crossing Links: 82, 83, 85, 86
- 14. Exit Taxiway Location: 88, 118, 119
- 15. Holding Areas: 44, 45, 46, 49
- 16. Airline Gates: Using Gate Areas
- 17. General Aviation Basing Areas: West of terminal area, 48.

C. ATC PROCEDURES

18. Aircraft Separations: These values are based on Report No. FAA-EM-78-8A.

Arrival-Arrival Separation (n.m.)-VFR

		Trail	Aircı	caft C	lass
		A	В	<u>C</u>	D
Lead	A	1.9	1.9	1.9	1.9
Aircraft	В	2.7	1.9	1.9	1.9
Class	С	2.7	1.9	1.9	1.9
	D	4.5	3.6	3.6	2.7

Departure-Departure Separations (seconds)

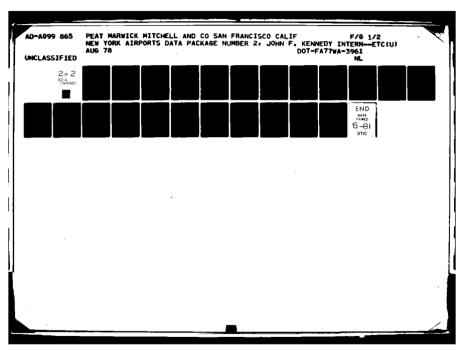
		Trail	Airc:	raft (Class
		A	В	С	Δ
Lead	Α	35	45	45	50
Aircraft		50	60	60	60
Class	С	50	60	60	60
	D	120	120	120	90

Departure Arrival Separation (n.m.): 0.4 miles (Runway Clearance Times)

To release a departure there must be an 8-mile interval between arrivals to protect the glide-slope critical area.

Arrival-Departure Separation (seconds): (Runway
Occupancy Times)

- 19. Route Data: See Figure 2.
- 20. Two-Way Path Data: To be based on detailed network and a



21. Common Approach Paths:

Aircraft Class	Length of Common Approach Path
A	2.0
В	3.0
С	6.0
D	6.0

22. Vectoring Delays:

This input allocates delays among vectoring and holding. Model input values will be used that hold arrival aircraft if delays to arrival aircraft exceed 12 minutes.

- 23. Departure Runway Queue Control: Not applicable.
- 24. Gate Hold Control: Not applicable.

25. Departure Airspace Constraints:

Aircraft are not held at gates due to departure airspace constraints.

26. Inter-Arrival Gap:

With this runway use, arrival aircraft are delayed in the arrival airspace when departure delays exceed 20 minutes.

27. Runway Crossing Delay Control:

Arrival and departure runway operations are only interrupted for a taxiing aircraft to cross an active runway when the taxiing aircraft is delayed by 30 minutes or more.

D. AIRCRAFT OPERATIONAL CHARACTERISTICS

28. Exit Taxiway Utilization:

			Exit	Utiliz	ation
			q)	ercent	
		Class	L	N	M
Runway	13	A	100	 0	<u> </u>
		В	57	0	43
		С	0	42	58
		D	0	91	9

29. Arrival Runway Occupancy Times:

		Runway	Occupan (second	y Times s)
	Class	L	N	<u>M</u>
Runway 9	A	40	-	-
	В	42	-	48
	С	-	41	44
	D	-	-	47

- 30. Touch & Go Occupancy Times: Not applicable.
- 31. Departure Runway Occupancy Times:

Aircraft	Runway Occu	pancy Time (seconds)
Class	Mean	Standard Deviation
A	34	4
В	34	4
С	39	· 4
D	39	4

- 32. Taxi Speeds: To be based on reduced field data.
- 33. Approach Speeds:

Aircraft	Appro	ach Speed (knots)
<u>Class</u>	Mean	Standard Deviation
A	110	10
В	120	10
C	130	10
D	140	10

- 34. Gate Service Times: Not applicable.
- 35. Airspace Travel Times: To be based on reduced field data.
- 36. Runway Crossing Times: 20 seconds
- 37. Lateness Distribution: To be determined by Task Force.
- 38. Demand: To be determined by Task Force.

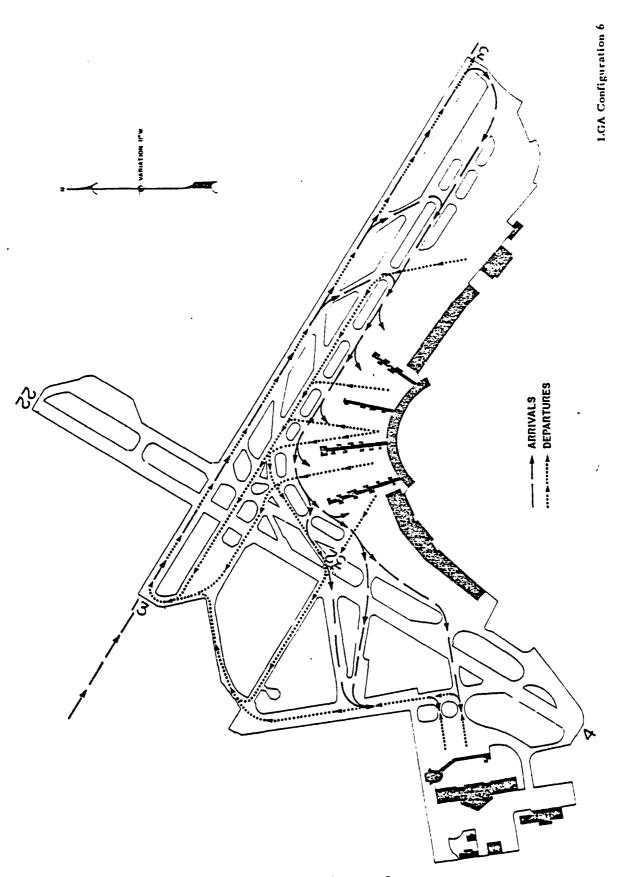


Figure 2

LGA - STAGE 1

Experiment No. 7

Objective:

To obtain baseline delay estimates in IFR1 conditions for the following runway-use configuration:

Arrivals	Departures
12	12

Related Comparison Experiments:

Experiments 10 and 10A have same runway use and weather, but they involve improvements.

(See attached change sheet)

Experiment Number: 7 (Input changes from experiment number 6)

	
SIMULATION MODEL INPUT	DESCRIPTION OF INPUT CHANGE
4. Lagistics	The state of the s
1 male	
2 Basics Burner seeds	
3 Start and finish times	
4 Price options	
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6 Processing options	<u> </u>
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b. Mistield Physical Chamcastistics	
9 Airtiald namers	
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12' Departure number and links	
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14 Trit turiny location	
15 Holding arms	
15 <u>Nimbiae gates</u>	
17 General aviation basing areas	
c. ACC Procedures	
13 Aircraft separations	IFRL Values and critical zone impac
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11 Departura simpson constraints	
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26 Caparture queue . 27 Emway Crossing delay control d. Aircraft Crerational Characteristics	
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LGA - STAGE 1

Experiment No. 10

Objective:

To evaluate impact of relocating Rl3 glide slope antenna to reduce critical zone impact when there are mixed operations on Rl3. This experiment assumes that the impact is reduced and a departure can be released when there is a _____ mile interval between arrivals.

Related Comparison Experiments

Experiment No. 7 serves as the comparison case for this experiment.

(See attached change sheet)

Experiment Number: 10 (Input changes from experiment number 6)

SIMULATION MODEL INPUT	DESCRIPTION OF INPUT CHANGE
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15 Holding areas	
16 Airline gates	
17 General aviation basing arras	
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d. Airmate Cressional Cameracistics	
25 Exis taxiway utilization	
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36 Tours-end-go resway occupancy times	
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LGA - STAGE 1

Experiment No. 10A

Objective:

To evaluate the impact of LGA-TEB interaction on delays experienced by mixed operations on Rl3 in IFRl weather conditions.

Related Comparison Experiments:

Experiment No. 7 serves as the "No-other-improvement" comparison case for this experiment. Experiment No. 10 is the comparison case if one wants to examine the limits imposed on the delay reductions of Experiment 10 by the LGA-TEB interaction.

(See attached change sheet)

	.
SIMULATION MODEL INPUT	DESCRIPTION OF INPUT CHANGE
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13 Remway crossing links	
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15 Enling arms	
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20 Thoway pach data	
T Command paths	IFR1 Values
22 Vectoring delays	<u> </u>
23 Separation remay queue control	
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IS CAPACITIES QUEUS .	
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d. Airmat Germinal Carameristics	
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33 Yabaares abengs	IFR1 Values
34 Gate service times .	
25 Airspace gravel times	
16 Ampley cressing times	
37 Litaness distribution	IFR1 (if different)
35 Canad	

LGA - STAGE 1

Experiment No. 8

Objective:

To obtain baseline delay estimates, in IFR1 conditions, for the following runway use configuration:

Arrivals Departures
R4 R4

Related Comparison Experiments:

Experiment No. 13 has same runway use and weather conditions as No. 8 but with an improved taxiway network for departures west of R4/22.

(See attached data input summary)

LGA INPUT DATA - EXPERIMENT NO. 8

A. LOGISTICS

- 1. <u>Title</u>: LaGuardia Airport Airfield Simulation Model Stage 1 Run
- 2. Random Number Seeds: 2017, 3069, 4235, 5873, 6981, 7137, 8099, 9355, 0123, 1985.
- 3. Start and Finish Times: To be determined by Task Force.
- 4. Print Options: Detailed run for one random number seed. Summary run for ten random number seeds.

5.	Airline	Names:	Name	Code
			Air Taxi	AΤ
			Allegheny	\mathtt{AL}
			American	AA
			Braniff	BN
			Delta	\mathtt{DL}
			Eastern	EA
			National	NA
			North Central	NC
			Northwest	NW
			Ozark	ΟZ
			Piedmont	PI
			Southern	so
			Trans World	TW
			United	UA

- 6. Processing Options: First run to check model input. Other runs in COMPUTE mode.
- 7. Truncation Limits: + 3 standard deviations.
- 8. Time Switch: Not applicable.

B. AIRFIELD PHYSICAL CHARACTERISTICS

- 9. Airfield Network: See Figure 1.
- 10. Number of Runways: 1
- 11. Runway Identification: 4

- 12. Departure Runway End Links: 77, 190
- 13. Runway Crossing Links: 191
- 14. Exit Taxiway Location: 50, 84, 86, 87
- 15. Holding Areas: 44, 45, 46, 49
- 16. Airline Gates: See Figure 1.
- 17. General Aviation Basing Areas: West of terminal area, 48.

C. ATC PROCEDURES

18. Aircraft Separations: These values are based on Report No. FAA-EM-78-8A.

Arrival-Arrival Separation (n.m.) - IFR - Without Buffer

		Trail	Aircr	aft C	lass
		A	<u>B</u>	С	D
Lead	A	3.0	3.0	3.0	3.0
Aircraft	В	4.0	3.0	3.0	3.0
Class	С	4.0	3.0	3.0	3.0
	D	6.0	5.0	5.0	4.0

<u>Departure-Departure Separations (seconds) - IFR - Case 26 Specific</u>

		Trail	Airci	raft Cl	ass
		A	В	C	D
Lead	A	60	60	82	84
Aircraft	В	60	60	60	62
Class	C	60	60	60	62
	D	120	120	120	90

Departure-Arrival Separation (n.m.): 0.4 miles

Arrival-Departure Separation (seconds): 10 seconds

- 19. Route Data: See Figure 2.
- 20. Two-Way Path Data: To be based on detailed network coding.

21. Common Approach Paths:

Aircraft Class	Length of Common Approach Path
A	6.0
В	6.0
С	6.0
D	6.0

22. Vectoring Delays:

This input allocates delays among vectoring and holding. Model input values will be used that hold arrival aircraft if delays to arrival aircraft exceed 12 minutes.

- 23. Departure Runway Queue Control: Not applicable.
- 24. Gate Hold Control: Not applicable.

25. Departure Airspace Constraints:

Aircraft are not held at gates due to departure airspace constraints.

26. Inter-Arrival Gap:

With this runway use, arrival aircraft are delayed in the arrival airspace when departure delays exceed 20 minutes.

27. Runway Crossing Delay Control:

Arrival and departure runway operations are only interrupted for a taxiing aircraft to cross an active runway when the taxiing aircraft is delayed by 30 minutes or more.

D. AIRCRAFT OPERATIONAL CHARACTERISTICS

28. Exit Taxiway Utilization:

		Exit (Jtili:	zation	(per	rcent)
	Class	F	<u>Q</u> _	<u>P</u>	RR	R
Runway 4	A	100	0	0	0	0
	В	0	57	43	0	0
	С	0	6	58	36	0
	D	0	0	9	72	19

29. Arrival Runway Occupancy Times:

			Rui	nway	Occupa (seco		imes
		<u>Class</u>	<u>F</u>	Q	<u>P</u>	RR	R
Runway	4	A	40	-	-	_	-
		В	42	-	48	-	_
		С	_	41	44	52	-
		D	_	-	47	58	64

- 30. Touch & Go Occupancy Times: Not applicable.
- 31. Departure Runway Occupancy Times:

Aircraft	Runway Occupancy Time (seconds)			
Class	Mean	Standard Deviation		
A	34	4		
В	34	4		
C	39	4		
D	39	4		

- 32. Taxi Speeds: To be based on reduced field data.
- 33. Approach Speeds:

Aircraft	Appr	oach Speed (knots)
Class	Mean	Standard Deviation
A	120	10
B	120	10
С	130	10
מ	140	10

- 34. Gate Service Times: Not applicable. Gate area used.
- 35. Airspace Travel Times: To be based on reduced field data.
- 36. Runway Crossing Times: 20 seconds.
- 37. Lateness Distribution: To be determined by Task Force.
- 38. Demand: To be determined by Task Force.

Figure 2
(Under Development)

LGA - STAGE 1

Experiment No. 13

Objective:

To evaluate the impact of an improved taxiway network west of R4/22 on IFR1, mixed operations on R4.

Related Comparison Experiments:

Experiment No. 8 serves as the comparison case for this experiment. Model has one, and only one, route from gate to roll, but application is still possible by varying schedule inputs.

(See attached change sheet)

Experiment Number: 13 (Input changes from experiment number 8)

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2 Apriles manage Saeris	·
I Start and States wines	
4 Print options	
S Ainline names	
6 Penewaking options	
7 Commercian Limits	
i Zina switch	
b. Airfield Straight Commentation	
9 Airdield Requests	New taxiway links west of R4/22
. 10 Number of Tunkays	
L Amer identification	
12' Departure states and links	
13 Reway crossing links	Possible new departure crossings
14 Exit trainsy location	
li Enlding areas	
15 Airline gates	
17 General aviation besing armses	
·	
6. All Procedures	
14 Airmait separations	
19 Aputa dana .	New departure routes
22 Thomey path data	Possible new ones
The Common spinioses pastes	
22 Vectoring delays	-
22 Separate remay queue control	
24 Gaza bold control.	Possible change due to new departure
25 Departure airspace constraints	
25 Ceparture queue .	
27 Reway crossing delay control	
d. Airmait Coordinal Caracteristics	
23 Eric taxivey utilization	Possible change
29 Ammiral removey company times	Possible change
30 Truck-end-yo ranway company times	
11 Departure Finney Occupancy times	
12 Taxi speeds	
13 Approach speeds	
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25 Airspace Cravel times	
16 Number ordering times	
27 Latabess distribution	Possible change for departures
38 Capsag	Need to circumvent problem of one
	route from gate to roll

LGA - STAGE 1

Experiment No. 9

Objective:

To evaluate the potential delay savings of improving airspace procedures so that the flow of arrivals to R13, in IFR1 weather conditions, is independent of the flow of departures on R4.

Related Comparison Experiments:

The potential benefits of these improved airspace procedures are obtained by comparison with Experiment No. 7, arrivals and departures on R13.

Remaining Data Items:

o Achievable separations from improvements, e.g., as compared to Study Case 19 in VFR1.

(See attached data input summary)

LGA INPUT DATA - EXPERIMENT NO. 9

A. LOGISTICS

- 1. <u>Title:</u> LaGuardia Airport Airfield Simulation Model Stage 1 Run
- 2. Random Number Seeds: 2017, 3069, 4235, 5873, 6981, 7137, 8099, 9355, 0123, 1985.
- 3. Start and Finish Times: To be determined by Task Force.
- 4. Print Options: Detailed run for one random number seed. Summary run for ten random number seeds.

5.	Airline Names:	Name	Code
		Air Taxi	AT
		Allegheny	\mathtt{AL}
		American	AA
		Braniff	BN
		Delta	\mathtt{DL}
		Eastern	EA
		National	NA
		North Central	NC
		Northwest	NW
		Ozark	OZ
		Piedmont	PI
		Southern	SO
		Trans World	TW
		United	UA

- 6. Processing Options: First run to check model input. Other runs in COMPUTE mode.
- 7. Truncation Limits: + 3 standard deviations.
- 8. Time Switch: Not applicable.

B. AIRFIELD PHYSICAL CHARACTERISTICS

- 9. Airfield Network: See Figure 1.
- 10. Number of Runways: 2
- 11. Runway Identification: 4, 13

- 12. Departure Runway End Links: 77, 190
- 13. Runway Crossing Links: 81, 82, 85, 86, 191
- 14. Exit Taxiway Location: 88, 118, 119
- 15. Holding Areas: 44, 45, 46, 49
- 16. Airline Gates: See Figure 1.
- 17. General Aviation Basing Areas: West of terminal area, 48.

C. ATC PROCEDURES

18. Aircraft Separations: These values are based on Report No. FAA-EM-78-8AA.

Arrival-Arrival Separation (n.m.) IFR Without Buffer if achievable

		Trail	<u>Aircı</u>	<u>raft C</u>	lass
		A	В	C	D
Lead	A	3.0	3.0	3.0	3.0
Aircraft	В	4.0	3.0	3.0	3.0
Class	С	4.0	3.0	3.0	3.0
	D	6.0	5.0	5.0	4.0

<u>Departure-Departure Separations (seconds) - IFR - if achievable</u>

		Trail	L_Aircı	caft C	lass
		A	В	_C_	D
Lead	A	60	60	60	60
Aircraft	В	60	60	60	60
Class	С	60	60	60	60
	D	120	120	120	90

Departure-Arrival Separation (n.m.): 0.4 miles

Arrival-Departure Separation (seconds): 10 seconds

- 19. Route Data: See Figure 2.
- 20. Two-Way Path Data: To be based on detailed network coding.

21. Common Approach Paths:

Aircraft Class	Length of Common Approach Path
A	6.0
В	6.0
С	6.0
D	6.0

22. Vectoring Delays:

This input allocates delays among vectoring and holding. Model input values will be used that hold arrival aircraft if delays to arrival aircraft exceed 12 minutes.

- 23. Departure Runway Queue Control: Not applicable.
- 24. Gate Hold Control: Not applicable.

25. Departure Airspace Constraints:

Aircraft are not held at gates due to departure airspace constraints.

26. Inter-Arrival Gap:

With this runway use, arrival aircraft are delayed in the arrival airspace when departure delays exceed 20 minutes.

27. Runway Crossing Delay Control:

Arrival and departure runway operations are only interrupted for a taxiing aircraft to cross an active runway when the taxiing aircraft is delayed by 30 minutes or more.

D. AIRCRAFT OPERATIONAL CHARACTERISTICS

28. Exit Taxiway Utilization:

		Exit Util	n (percent)	
	Class	L	N	<u>M</u> _
Runway 13	Α	100	0	0
_	В	57	43	0
	С	6	58	36
	D	0	28	72

29. Arrival Runway Occupancy Times:

			Runway Occupany Times (seconds)		
		Class	L	N	M
Runway	22	A	40	-	-
_		В	42	48	-
		С	41	44	52
		D	-	47	58

- 30. Touch & Go Occupancy Times: Not applicable.
- 31. Departure Runway Occupancy Times:

Aircraft	Runway Occupancy Time (seconds)		
Class	Mean	Standard Deviation	
A	34	4	
В	34	4	
С	39	4	
D	39	4	

- 32. Taxi Speeds: To be based on reduced field data.
- 33. Approach Speeds:

Aircraft	Appro	ach Speed (knots)
Class	Mean	Standard Deviation
A	110	10
В	120	10
С	130	10
D	140	10

- 34. Gate Service Times: Not applicable. Gate area used.
- 35. Airspace Travel Times: To be based on reduced field
- 36. Runway Crossing Times: 20 seconds.
- 37. Lateness Distribution: To be determined by Task Force.
- 38. Demand: To be determined by Task Force.

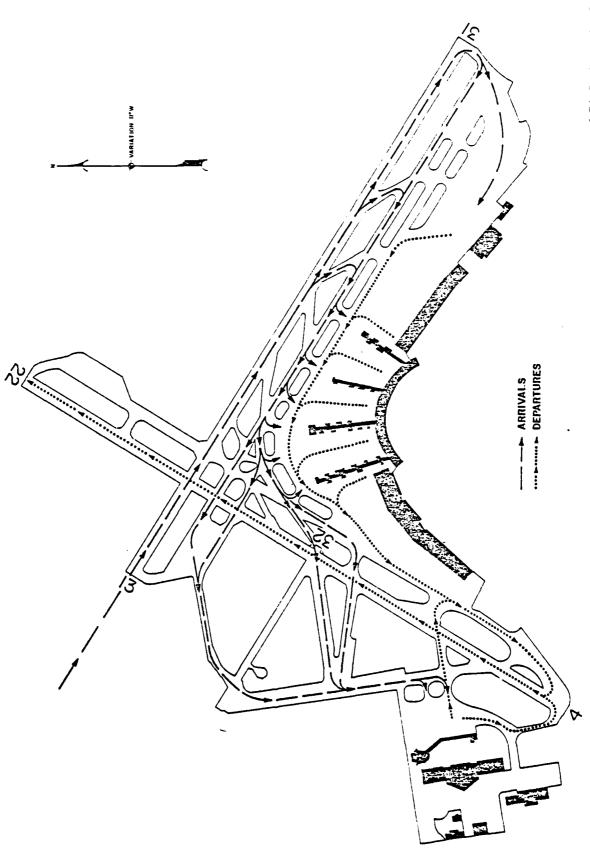


Figure 2

